

Vietnam

ENVIRONMENT

Monitor 2004

Solid Waste

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CIDA

The Ministry of Environment and Natural Resources (MONRE), the World Bank, and the Waste-Econ Project (funded by CIDA) contributed to the preparation of this document. A team of consultants consolidated much of the data up to 2003 from a variety of sources, including published reports of government agencies, universities, nongovernmental organizations, individuals, and documents of the World Bank and international partners.

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Comments on the report were received from the ministries of Industry, Agriculture and Rural Development, Health, Construction, Foreign Affairs, Finance, Planning and Investment, and many researchers.

We gratefully acknowledge the advice and contributions of Messrs./Mmes. Magda Lovei, Phillip Brylski, Dan Biller, Bekir Onusal, Alan Coulthart, Bill Kingdom, Le Duy Hung, Dang Duc Cuong, Rob Swinkels, Soren Davidsen, Philip Gray, and Keiko Sato of the World Bank; and Chris Furedy from Furedy Research and Advising Inc.

We especially appreciate the support and encouragement given by Mr. Mai Ai Truc, Minister, and Mr. Pham Khoi Nguyen, Vice Minister of MONRE, Mr. Klaus Rohland, Country Director of the World Bank Vietnam, and Mme. Teresa Serra, Sector Director of the Environment and Social Development Sector Unit of the East Asia and Pacific Region of the World Bank.

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Abbreviations and Acronyms

ADB	Asian Development Bank	NA	Not Available
ANR	National Association of Recyclers	NCMG	Nhan Chinh Model Group of Solid Waste Collection
CER	Certified Emission Reductions	NEA	National Environment Agency
COD	Chemical Oxygen Demand	NGO	Nongovernmental Organization
CP	Cleaner Production	NISTPASS	Institute for Science and Technology Policy and Strategy Studies
BOD	Biochemical Oxygen Demand		
CEETIA	Center for Environmental Engineering of Towns and Industrial Areas	NSEP	National Strategy for Environmental Protection
CENTEMA	The Center for Environmental Technology and Management	PC	People Committee
CDM	Clean Development Mechanism	PCB	Polychlorinated Biphenyls
DOH	Department of Health	PCF	Prototype Carbon Fund
DOI	Department of Industry	Pg	Pico grams
DONRE	Department of Natural Resources and Environment	POPs	Persistent Organic Pollutants
DOSTE	Department of Science, Technology and Environment	SME	Small and Medium Enterprises
EIA	Environmental Impact Assessment	SOE	State Owned Enterprise
GDP	Gross Domestic Product	SPM	Solid Particulate Matter
GIS	Geographic Information Systems	SS	Suspended solids
GNP	Gross National Product	SWM	Solid Waste Management
GOV	Government of Vietnam	TCVN	Directorate for Standards and Quality
g/dL	Grams per deciliter	TEQ	Toxicity Equivalent
GTZ	German Agency for Technical Cooperation	TSP	Total Suspended Particulates
GWh	Gigawatt hour	TSS	Total Suspended Solids
ha	Hectare	TUPW	Department of Transport and Urban Public Works
HCMC	Ho Chi Minh City	UNEP	United Nations Environment Program
IDA	International Development Association	UNIDO	United Nations Industrial Development Organization
INEST	Institute of Environmental studies and Technology	URENCO	Public Urban Environment Company
IZMB	Industrial Zone Management Board	VEPA	Vietnam Environmental Protection Agency
JBIC	Japan Bank for International Cooperation	VITTEP	The Vietnam Institute of Tropical Technology & Environmental Protection
JICA	Japan International Cooperation Agency	VOCs	Volatile Organic Compounds
IRR	Internal Rate of Return	VND	Vietnamese Dong
Kg	Kilogram	WB	World Bank
g	Micrograms	WHO	World Health Organization
MONRE	Ministry of Natural Resources and Environment		
MOC	Ministry of Construction		
MOH	Ministry of Health		
MOI	Ministry of Industry		
MoSTE	Ministry of Science, Technology and Environment		
MPI	Ministry of Planning and Investment		
MRC	Mekong River Commission		

VND: Vietnam Dong

\$: US dollar

Exchange rate (2004): 15,600 VND/\$

Foreword

Environment Monitors focus on environmental trends, challenges, and priorities and are meant to inform and engage policymakers and stakeholders. This Monitor is the third in the series of reports initiated in 2002. The first Vietnam Environment Monitor reviewed general environmental trends. The second focused on water resources management. Environment Monitor 2004 discusses solid waste management issues.

Growth and environmental protection go hand-in-hand in the vision of sustainable development. Vietnam is projected to be one of the world's fastest growing economies, with projected growth rates around 7 percent over the next decade. Thanks to Vietnam's strong past growth, around 20 million people have risen above the poverty line in less than a decade. However, the country's rapid economic growth also presents an unprecedented environmental challenge, particularly for burgeoning urban and industrial areas, which already experience serious health and environmental impacts.

Solid waste is a growing problem for Vietnam. The country is producing more than 15 million tons of waste each year, and this volume is expected to grow rapidly over the next decade. Urban areas, which contain only 24 percent of the population of the country, produce more than 6 million tons—50 percent—of the country's municipal waste. By 2010, municipal waste generation is expected to increase by over 60 percent. In addition, expanding urbanization, combined with industrial growth and the modernization of healthcare services, will lead to a significant increase in hazardous and hazardous healthcare waste generation, posing serious health concerns if not properly managed.

The country has responded with a sound legal framework, an aggressive investment plan, and an emphasis on improving local services, especially in major cities. However, achieving the goal of safe and cost-effective management and disposal of waste will remain a major challenge, requiring concerted efforts by government, industries, hospitals, solid waste operators, and individuals.

To help respond to this emerging issue, the Vietnam Environment Monitor 2004 was developed to (a) examine the current status and trends in solid waste quantities, types, and sources; (b) highlight the key issues in solid waste management, such as waste handling, institutional roles and capacity, the legal framework, and financial issues; and (c) identify the challenges for improvement to solid waste management in Vietnam.

This Monitor is a joint effort by the Ministry of Natural Resources and Environment (MoNRE), the World Bank, and the Canadian International Development Agency's (CIDA) Waste-Econ Project. The maps printed in this report cover only areas from which the information was collected for this report. The boundaries, colors, denominations and any other information shown on these maps do not imply any judgment on the legal status on any territory, or any endorsement or acceptance of such boundary.

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Introduction

Given Vietnam’s unprecedented economic growth, waste from households, industries, commercial enterprises, and hospitals is expected to increase rapidly over the next decade. Managing this waste is a monumental challenge—both because of its substantial cost and its large potential benefits to public health and the quality of life. It is also important for improving the lives of many poor Vietnamese, who are more susceptible to the health effects of improper waste management and rely on informal waste collection and recycling activities for their livelihood. Recognizing the economic and social costs of poor solid waste management, the Government of Vietnam is addressing these issues through a combination of policies, financing, and public awareness and participation.

The Vietnam Environment Monitor 2004 supports these efforts by providing an overview of the solid waste management sector, consisting of waste generation; waste handling, including collection, disposal, treatment, and recycling; and management issues, including policy, institutional, budget, and financing. It concludes with a summary describing the challenges for Vietnam to achieve cost-effective solid waste management that can help reduce poverty, improve public health, and enhance environmental quality.

Due to the lack of national surveys and inventories, a number of estimates were made by the consultants and World Bank staff. The basis for these estimates is described in the methodology section in the back of the report.

As used in this report, the term solid waste covers municipal garbage, industrial waste, health care waste and some cultivation waste. It does not, however, include sewage sludge, construction demolition waste, and mining residues.

Waste Generation

Vietnam produces over 15 million tons of waste each year from various sources. More than 80 percent (12.8 million tons/yr) is from municipal sources, including households, restaurants, markets, and businesses. Industries generate over 2.6 million tons of waste (17 percent) each year, making it the second most significant source. About 160,000 tons/yr (1 percent) of Vietnam’s waste is considered hazardous, including hazardous healthcare waste from hospitals; toxic or flammable waste from industrial processes; and pesticides and pesticide containers from agriculture. If not managed well, the toxic, carcinogenic, hazardous healthcare, and other hazardous properties of this waste pose a significant threat to public health and the environment.

Municipal solid waste generation (tons/yr)	
• National	12,800,000
• Urban areas	6,400,000
• Rural areas	6,400,000
Hazardous waste generation by industries (tons/yr)	128,400
Non hazardous waste generation by industries (tons/yr)	2,510,000
Hazardous healthcare waste generation (tons/yr)	21,000
Hazardous waste from agriculture (tons/yr)	8,600
Amount of stockpiled agricultural chemicals (tons)	37,000
Municipal waste generation (kg/pers/day)	
• National	0.4
• Urban areas	0.7
• Rural areas	0.3
Collection of waste (% of waste generated)	
• Urban areas	71%
• Rural areas	<20 %
• Among urban poor	10-20%
No. of solid waste disposal facilities	
• Dumps and poorly operated landfills	74
• Sanitary landfills	17
Capacity for hazardous healthcare waste treatment (% of total).	50%

Data compiled from Vietnam Environment Monitor 2004

Waste is concentrated in urban areas. Urban areas contain only 24 percent of the population of the country, but produce over 6 million tons (50 percent) of the country's municipal waste. This is due to the more affluent lifestyles, larger quantity of commercial activities, and more intense industrialization found in urban areas. These activities also increase the proportion of hazardous waste (such as batteries and household solvents) and non-degradable waste (such as plastic, metal, and glass) found in urban waste. In contrast, people in rural areas produce municipal waste at less than half of the rate of those in urban areas (0.3 kg/person/day vs. 0.7 kg/person/day), and most of the waste (99 percent of cultivation waste and 65 percent of domestic waste vs. 50 percent for urban domestic waste) is easily degradable organic waste.

Industrial waste is concentrated in focus economic zones, industrial parks, and urban areas. About 80 percent of the 2.6 million tons of industrial waste generated each year is from the industrial centers in the North and South. Ho Chi Minh City and surrounding provinces generate nearly 50 percent of the country's industrial waste; 30 percent is generated in the North Coast–Red River Delta region. Additionally, the nearly 1,500 craft villages—predominantly found in rural areas in the North—produce 774,000 tons/yr of non-hazardous waste.

Hazardous waste generation poses a growing threat. The largest sources of hazardous waste are industries (130,000 tons/yr) and hospitals (21,000 tons/yr of hazardous healthcare waste). Additionally, agricultural sources produce approximately 8,600 tons of pesticides and contaminated pesticide containers each year and past pesticide use has resulted in the accumulation of an estimated 37,000-ton stockpile of confiscated agricultural chemicals. Regional differences in hazardous waste generation are significant; in the case of industrial hazardous waste generation, the Southern Focus Economic Zone accounts for 75 percent of the industrial hazardous waste in the country. Some 27 percent of the country's hazardous healthcare waste is located in HCMC, Hanoi, and Thanh Hoa, while most hazardous agricultural waste is found in the agricultural areas of the Mekong River Delta.

Dramatic increases in waste generation are expected. By 2010, Vietnam will have a projected 10 million more urban dwellers. Consumption will grow; manufacturing will grow, with more rapid growth in hazardous waste intensive industries; and health care will undergo continued modernization. These changes are estimated to result in a 60 percent increase in municipal waste generation; a 50 percent increase in industrial waste generation; and an over threefold increase in hazardous waste generation, mostly attributable to industrial sources. Considering the high cost of safe collection and disposal, initiatives to reduce waste—such as promoting public awareness and cleaner production, and introducing economic incentives based on the Polluters Pay Principle—could result in significant savings. For example, a 10 percent reduction in waste generation could result in an annual disposal savings of approximately VND 200 billion and VND 130 billion for municipal and hazardous healthcare waste, respectively.

Waste Handling

The handling of waste—including reuse and recycling, collection, treatment and disposal—is crucial to providing a cost-effective waste management system that is able to reduce public health and environmental risks. Most of the municipal waste in Vietnam is not safely disposed. However, there have been significant improvements by the public urban environmental companies (URENCOs) that are responsible for municipal waste collection and disposal. Proper handling of hazardous waste, which is the responsibility of the industries and hospitals that produce it, remains severely limited. Recycling and reuse in Vietnam is an active industry in Vietnam, driven by an informal network of waste pickers at landfills, informal waste collectors, and waste buyers.

Municipal Waste

Cities are collecting more municipal waste. Waste collection in cities is improving, but is limited in rural and poor areas. Urban areas collect an average of 71 percent of the waste, a number that has increased steadily since 2000. In general, larger cities in Vietnam collect a larger percentage of their waste (76 percent) than smaller cities (70 percent), while in rural areas collection rates are typically less than 20 percent. The poor are largely not served by collection services; nine out of ten of the poorest urban households do not receive solid waste collection service. New initiatives are being promoted to fill the gaps in municipal waste collection service. For example, community-based and private sector organizations are collecting waste in rural villages and in urban areas without municipal coverage.

Municipal waste disposal practices are improving but still represent a threat to health and environment. The dominant form of disposal of municipal waste remains open dumping; 49 sites have been identified on a national list as hotspots with high environmental and human health risks. Of the 91 disposal sites in the country, only 17 are sanitary landfills. In many areas, self-disposal methods—such as burning or burying waste, or dumping in rivers, canals, and open fields—is common. Poorly operated landfills and open dump sites cause environmental problems for the surrounding communities, including contamination of ground and surface water by untreated leachate, emissions of airborne pollutants, and the spread of odors, flies, mosquitoes, rodents, dust, and noise, leading to a high incidence rate of skin, digestive, and respiratory disease.

Hazardous Waste

Industrial hazardous waste treatment systems are largely inadequate. Given the lack of combined treatment facilities and limited incentives for safe disposal, many industries practice a variety of unsafe methods of treatment and disposal, including allowing URENCOs to collect and dispose the hazardous waste with municipal waste; storage onsite; sale to recyclers, or even indiscriminate dumping. For larger industries and industrial zones, some common practices are emerging, including using simple furnaces or industrial boilers in nearby industries or specialized waste treatment enterprises.

Hazardous healthcare waste treatment capacity is growing but hampered by poor operation. Recent investments have established enough incinerator capacity to treat 50 percent of Vietnam's hazardous healthcare waste. However, a lack of financing for operation and maintenance of incinerators has often led to improper operation, which increases the risk of toxic dioxin and furan emissions or the disposal of healthcare waste as municipal waste. There is a need to develop a coherent and consistent approach to health care waste management.

Stockpiled agricultural chemicals are being treated. Roughly half of agricultural chemical wastes stockpiled in storage areas were treated in 2002 by using incineration and chemical techniques. However, the treatment is expensive and often conducted in an unsatisfactory manner, posing the risk of further environmental impacts, either as contaminated sludge and ash, or by air emissions, including heavy metals, dioxin, and furans.

Waste Re-use and Recycling

Recycling is common practice in Vietnam. Households routinely separate recyclable wastes such as metals and paper for sale to itinerant buyers, or sell it directly to local depots. Waste pickers are also separating reusable and recyclable wastes. This dynamic recycling market is largely led by the informal sector; in Hanoi, for example, the informal sector recycles 22 percent of all waste

produced. In the industrial sector, several types of industries can recycle as much as 80 percent of their waste. Artisans and workers at many craft villages have been particularly successful in capitalizing on this opportunity, recycling over 90 percent of their potentially recyclable waste. Annual cost savings on disposal could be substantial. For example if each of 6 key industries could recycle 50 percent of its potentially recyclable wastes they would save VND 54 billion on disposal costs. Similarly, a 10 percent decrease in municipal waste could save VND 200 billion annually on disposal.

The market for recyclables has a large potential for expansion. Thirty-two percent of the municipal waste currently placed in disposal sites in urban areas in Vietnam, or 2.1 million tons per year, consists of commercially recyclable materials such as paper, plastic, metal, and glass. This additional recycling could result in a substantial reduction in disposal costs and allow the largely poor informal sector to capture an estimated VND 135 billion per year in additional recycling revenues in HCMC alone.

The composition of Vietnamese waste makes composting potentially attractive The high proportion of organic matter in municipal waste provides potential for composting, which can reduce disposal costs while producing a marketable soil conditioner for uses such as agriculture and public. However, this practice is not widespread in Vietnam for many reasons, including inadequate separation of organic waste, poor product quality, and poor marketing. With the development of a strong market for composting fertilizers and successful source separation, the effectiveness of centralized composting facilities could increase considerably.

The poor involved in the informal recycling sector remain at risk. In terms of the ratio of waste pickers to total urban population, the size of the informal sector in Hanoi compares to that of Jakarta and Bangalore and is two times higher than in Manila. More than two-thirds of waste workers are women, who earn less than men working in the waste sector, and 9 percent of waste pickers are children. These groups tend to be socially marginalized. They frequently live on or near garbage disposal sites, and thus are exposed to environmental and safety hazards. A few efforts have been carried out to provide micro-credit to female waste pickers, and to reduce the number of children working at waste dumps. However, there is much to be done to support the informal waste sector.

Management Issues

While there are many barriers to effective implementation, Vietnam has put in place a sound legal framework for environmental protection and waste management. The institutional framework includes URENCOs as service providers for municipal waste management at the local level. Led by MoNRE, regulatory agencies at both central and local levels oversee and monitor the management of solid waste from industries, hospitals, and URENCOs. Several new strategies have resulted in a major increase in investment, especially in municipal waste. Nevertheless, several weaknesses remain.

Local institutions are limited by staff skills. While URENCOs allocate sufficient staff to undertake their duties, they suffer from a lack of equipment and capital, staff trained specifically for solid waste management, and an institutional mandate for cost-effective waste management. As they have focused much of their efforts on services for municipal waste management, URENCOs also have limited skills and equipment to provide potentially valuable hazardous waste collection and disposal services for hospitals and industries.

Regulations are not effectively enforced. Resources and institutional capability to implement Vietnam's policy framework are lacking at the operational level, and regulations are not effectively enforced. The regulation of waste management operators, industries, and hospitals—by MoNRE and other line agencies and authorities, including MOH, MOI, and IZMB—suffers from major gaps in enforcement and insufficient supervision of waste management practices, largely due to limited human resources, unclear mandates, fragmented and overlapping roles of various government agencies, and limited interagency coordination. This has resulted in limited incentives for proper operation of landfills or investments by industries in waste treatment, and has allowed inexpensive, unsafe methods of disposal—such as open dumping—to proliferate.

Lack of financing for operations threatens the sustainability of investments. Investments have increased nearly sixfold, from VND 195 billion in 1998 to VND 1,083 billion in 2003, and are expected to continue. Between now and 2020, planned landfill development, closure of unsafe open dumps, and further investment in incinerators for hazardous healthcare waste are expected to cost between VND 30 trillion and 40 trillion. However, the sustainability of these investments is questionable under current conditions, since there is limited spending on operation and maintenance of solid waste collection and disposal systems (0.18 percent of GNP, or VND 160,000 per ton), and fees can only cover about 50 percent of the expenditures for operation and maintenance of solid waste collection and disposal. While large subsidies from central and local governments (VND 400 billion in 2003) are provided, the resources are not adequate, especially in the case of disposal, where overall poor operation and maintenance has resulted in unsafe disposal sites. In many cities, improved cost recovery can be achieved through more effective fee collection and service agreements with the city's departments. In other cities, it may be necessary to increase fees, a measure that has met with resistance in many localities.

Civil society plays a limited role in waste management. Public communities and private groups currently play a limited role in solid waste management systems. To respond, the government has developed a number of policies and programs to promote public participation and carry out more public awareness programs, which has helped improve waste collection and other services such as street sweeping. Volunteer clean-up programs and public hygiene awareness campaigns have also started to gain momentum in Vietnam.

Challenges and Priorities

Vietnam's solid waste management needs are substantial in relation to existing capacity and the continued growth of urban areas and industrial development. Without undertaking the necessary measures to establish effective handling, treatment, and disposal systems, the growing quantities of waste can have various impacts, from increased health risks to environmental degradation. The broad challenges facing Vietnam include:

- Increasing the attention to SWM systems as integral parts of urban development programs, improving the balance of investments and their technical appropriateness
- Improving the financial and social sustainability of SWM investments
- Addressing the looming problems of hazardous waste generated by industrial enterprises, hospitals, and stockpiled agricultural chemicals
- Improving the protection of vulnerable groups.

Within these broad challenges, the specific priorities are:

1. Improving investments and operations for municipal waste management services. Making investments that are cost-effective, targeted to priority areas, and based on appropriate technology is a key task. The priorities are to ensure proper operation of existing landfills; expand collection to underserved areas and smaller urban centers through cost-effective investments and improved efficiency; improve SWM services available to poor households; and continue the national program of building new sanitary landfills. Improving services to the poor will require a combination of focused subsidies from the government and some cross subsidies from URENCOs, as well as expansion of community-based arrangements. Moreover, systematic consultation with and participation by poor communities is needed in the siting, impact assessment, and operation of landfills.

2. Improving cost recovery and the sustainability of investments. Improving the financial sustainability of SWM systems is a high priority. Different forms of fees—including flat rates, fees linked to provision of services such as water and electricity, and fees linked to ability-to-pay—should be explored. Private sector participation and getting polluters to pay should be promoted and supported by policies and other economic incentives.

3. Enhancing hazardous waste management regulations and practices. There is an urgent need to establish industrial hazardous waste management systems, including both factory-based handling, treatment, and disposal systems, and centralized or shared hazardous waste treatment facilities. The first priority action should be taken in the three Focus Economic Zones (Northern, Central, and Southern). In parallel with engaging the responsibility of industries and hospitals, policy and regulatory measures and financing mechanisms need strengthening, institutional responsibilities need clarity, and sufficient resources need to be allocated for monitoring and enforcement. Special attention should be placed on State Owned Enterprise (SOE) privatization to ensure that past environmental liabilities are properly addressed, and the environmental performance of enterprises is adequately monitored and enforced.

4. Improving institutional effectiveness, monitoring, and enforcement. Complementing the development of infrastructure and strengthening institutional capacity, improving financial management, and providing incentives for cost-effective management to URENCOs are the priorities. There is also a need to strengthen regulatory institutions for environmental oversight, monitoring, and enforcement of municipal waste management practices.

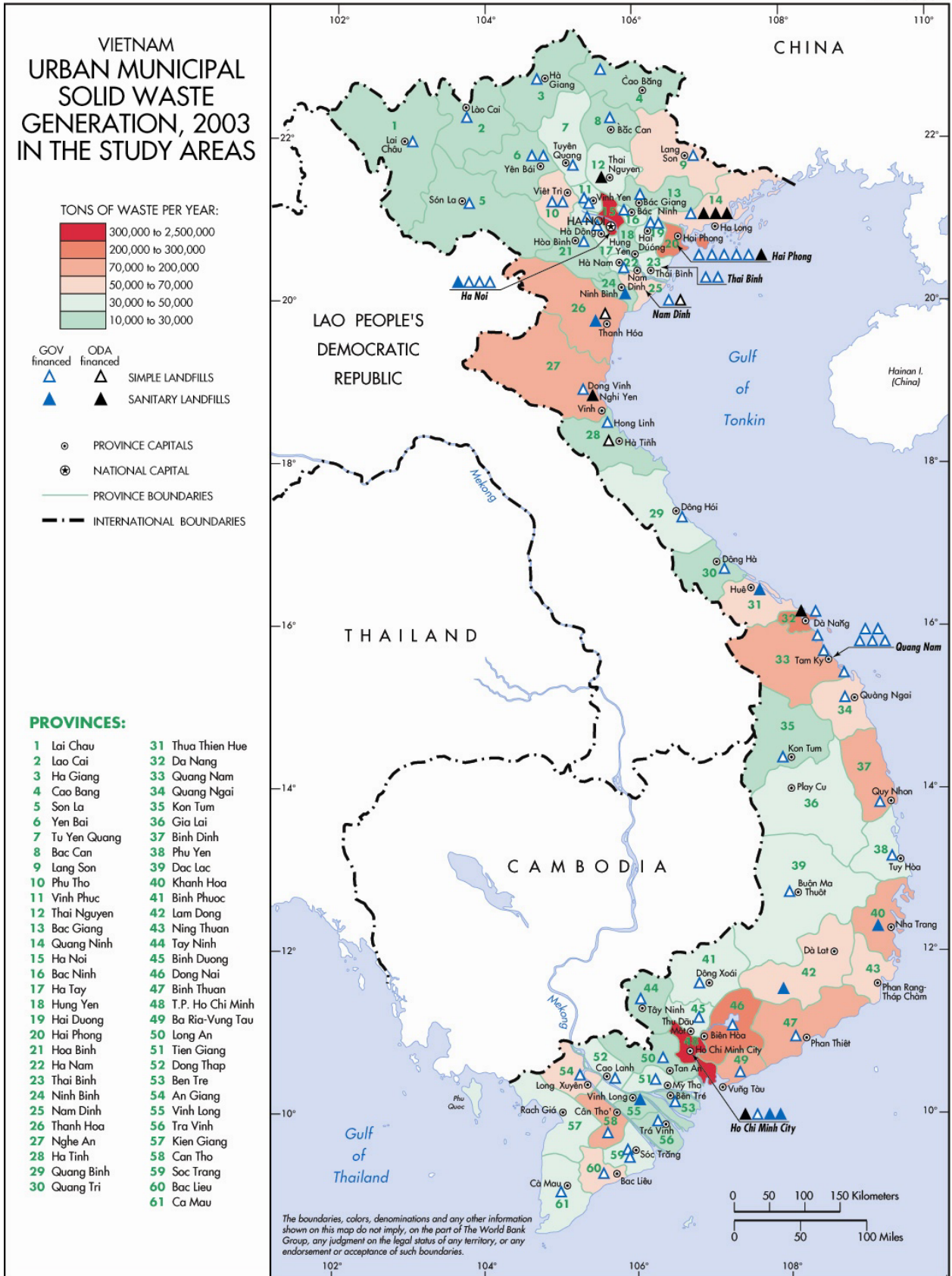
5. Creating incentives for waste minimization and recycling. Support to the informal waste sector could include expansion of micro-credit programs, development of recycling markets, integration of informal sector activities into the formal sector, assistance in the creation of waste cooperatives, and consultation on new waste management initiatives. Reducing the costs can be done through economic and other incentives for source separation and development of private sector recycling operations. Similarly, composting operations could be expanded through the development of viable composting facilities that can produce marketable quality compost from source-separated materials. Cleaner production technologies could be an option, since they could help minimize industrial waste and provide industrial ecology solutions.

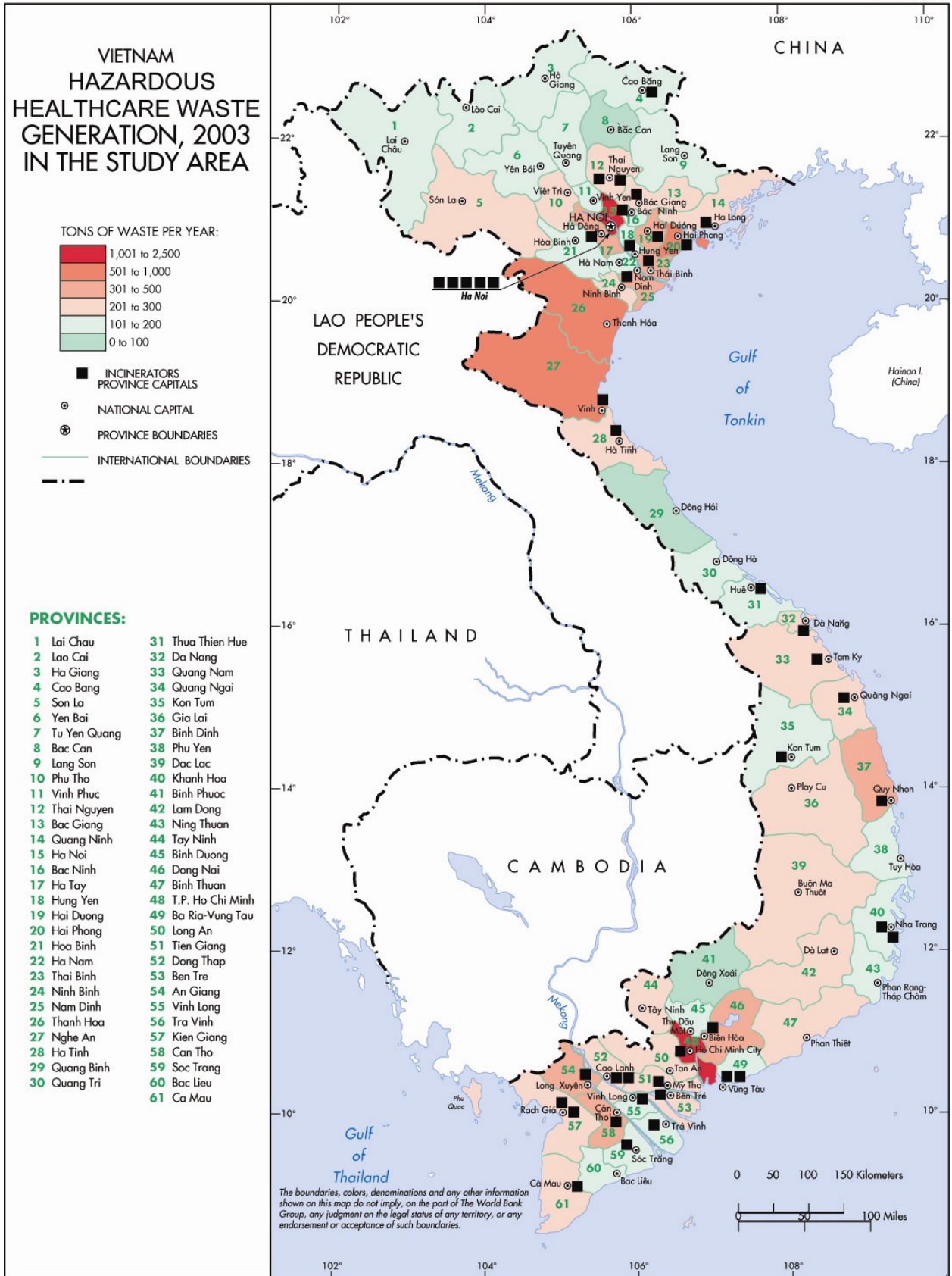
6. Improving public information on SWM and enhancing social acceptability of waste disposal and treatment. The public must be made aware of the negative consequences of improper waste management practices, and also their accountability in paying for better waste management services. Public education programs should target not only adults, but also children in the school system. They should also aim for providing basic hygiene knowledge. Further, they could contribute practical and innovative ideas to socialization programs, which could devolve

responsibility for waste management to local community groups. When siting landfills and during the operation, socioeconomic impacts need to be considered along with environmental impacts.

7. *Engaging communities in waste management.* There is also a need to strengthen the role of civil society in waste management. The challenge ahead will be to support initiatives that offer communities better opportunities to self-organize around community-based waste management issues. Local community groups may assume responsibility for hiring waste collectors, purchasing collection equipment, collecting fees, and overall management of the collection system. Communities should be encouraged to participate in source separation programs for composting organic waste.

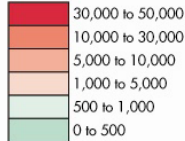
8. *Protecting vulnerable groups.* The SWM sector has three key vulnerable groups that require protection: waste pickers, poor women, and children. Initiatives to reduce the hazardous nature of their work could include requirements for safety equipment, limiting access to dump sites to periods when there are no trucks on the site, provision of public washing facilities at the dumpsites, and separation of hazardous wastes at dump sites into segregated cells. Gender equality and provision of expanded micro-credit opportunities for women in the informal sector should be considered. Special attention should be paid to providing child pickers with educational support and alternative vocational training.





VIETNAM
INDUSTRIAL
HAZARDOUS SOLID
WASTE GENERATION,
1999
IN THE STUDY AREAS

TONS OF WASTE PER YEAR:



- ⊙ PROVINCE CAPITALS
- ⊕ NATIONAL CAPITAL
- PROVINCE BOUNDARIES
- - - INTERNATIONAL BOUNDARIES

PROVINCES:

- | | |
|----------------|---------------------|
| 1 Lai Chau | 31 Thua Thien Hue |
| 2 Lao Cai | 32 Da Nang |
| 3 Ha Giang | 33 Quang Nam |
| 4 Cao Bang | 34 Quang Ngai |
| 5 Son La | 35 Kon Tum |
| 6 Yen Bai | 36 Gia Lai |
| 7 Tu Yen Quang | 37 Binh Dinh |
| 8 Bac Can | 38 Phu Yen |
| 9 Lang Son | 39 Dac Lac |
| 10 Phu Tho | 40 Khanh Hoa |
| 11 Vinh Phuc | 41 Binh Phuoc |
| 12 Thai Nguyen | 42 Lam Dong |
| 13 Bac Giang | 43 Ninh Thuan |
| 14 Quang Ninh | 44 Tay Ninh |
| 15 Ha Noi | 45 Binh Duong |
| 16 Bac Ninh | 46 Dong Nai |
| 17 Ha Tay | 47 Binh Thuan |
| 18 Hung Yen | 48 T.P. Ho Chi Minh |
| 19 Hai Duong | 49 Ba Ria-Vung Tau |
| 20 Hai Phong | 50 Long An |
| 21 Hoa Binh | 51 Tien Giang |
| 22 Ha Nam | 52 Dong Thap |
| 23 Thai Binh | 53 Ben Tre |
| 24 Ninh Binh | 54 An Giang |
| 25 Nam Dinh | 55 Vinh Long |
| 26 Thanh Hoa | 56 Tra Vinh |
| 27 Nghe An | 57 Kien Giang |
| 28 Ha Tinh | 58 Can Tho |
| 29 Quang Binh | 59 Soc Trang |
| 30 Quang Tri | 60 Bac Lieu |
| | 61 Ca Mau |



WASTE GENERATION

Vietnam's waste amounts to over 15 million tons each year, with municipal waste from households, restaurants, markets and businesses sources accounting for over 80 percent. Industries account for much of the remainder. Hazardous waste from industries and hazardous healthcare waste from hospitals, while produced in much smaller quantities, are important because they pose high health and environmental risks if not properly disposed (Table 1).

Municipal Waste

Cities in Vietnam are major generators of municipal waste. Urban areas contain only 24 percent of the country's population but produce over 6 million tons of waste each year, or 50 percent of the country's municipal waste. It is estimated that an average urban dweller in Vietnam produces over two-thirds of a kilogram of waste each day, about twice the amount produced by people in rural areas (Table 2).

Urban and rural households and businesses produce different types of waste. Municipal waste from households, markets, and businesses in rural areas contains a large proportion (60-75 percent) of easily degradable organic waste. In urban areas, where such waste is produced in lower quantities (approximately 50 percent of municipal solid waste), the change in consumption patterns and products is accompanied by a larger proportion of hazardous waste and non-degradable waste, such as plastic, metals, and glass (Table 3).

Table 1. Waste Generation in Vietnam in 2003

	Sources	Types	Waste Generation (tons/yr)		
			Urban	Rural	Total
Municipal Waste	Residential Commercial Markets	kitchen waste plastic paper glass	6,400,000	6,400,000	12,800,000
Industrial Non-Hazardous Waste	Industries	metals wood	1,740,000	770,000	2,510,000
Industrial Hazardous Waste	Industries	fuel oil waste sludge organic chemicals	126,000	2,400	128,400
Hazardous healthcare Waste	Hospitals	tissue samples blood syringes	-	-	21,500
Total-non agricultural waste			8,266,000	7,172,400	15,459,900
Agricultural	Cultivation Livestock	Plant matter	NA	64,560,000	64,560,000

*Note: Industrial waste excludes mining waste; rural industrial waste derives from craft villages,
Source: Consultant Data Group survey 2004, SOE report 2002, MOH 2004, NEA 1999, MOI 2002-2003*

Table 2. Municipal Solid Waste Generation

	Generation Rate (kg/person/day)	Waste Gen (% of total)	% organic
Urban Areas (national)	0.7	50	55
Ho Chi Minh City	1.3	9	
Hanoi	1.0	6	
Da Nang	0.9	2	
Rural Areas (national)	0.3	50	60-65

Source: Urban data by Consulting Data Group survey 2004; Rural data calculated using studies by NEA (2000) and Agriculture University No.1 (2003)

Table 3. Waste Composition in Hanoi

Waste component	Percent of total	
	1995	2003
Organic	51.9	49.1
Paper and textiles	4.2	1.9
Plastic, rubber, leather, wood, hair, feathers	4.3	16.5 (Plastics 15.6)
Metal	0.9	6.0
Glass	0.5	7.2
Inert matter	38.0	18.4
Others	0.2	0.9

Source: 1995 data from M. Digregorio 1997. East-West Center, Hawaii; 2003 data from CEETIA monitoring data, 2003

Industrial Waste

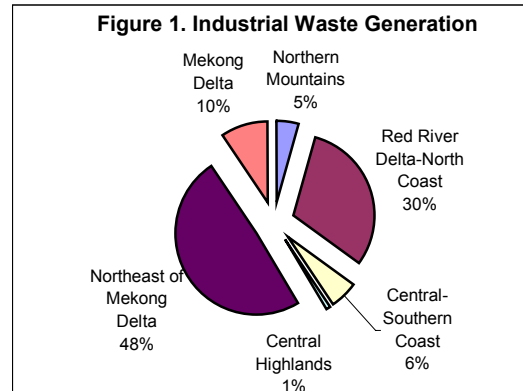
Industrial waste is estimated at about 20 to 25 percent of total municipal waste, depending on the size and industrial structure of a city or province.¹

Industrial waste is concentrated in the South. Nearly half of the industrial waste in the country (Figure 1) is produced in the Northeast Mekong Delta region. The main city in this region, Ho Chi Minh City, accounts for 31 percent of the total industrial waste generated in Vietnam. The Mekong Delta region is followed by the Red River Delta and North Coast regions.

Rural industrial waste from craft villages is concentrated in the North. Craft villages are a distinctive feature of Vietnam. They are rural villages where most of the village’s income comes from specialization in a particular craft, such as pottery making, textile and garment production, waste recycling, food processing, or other handicraft production. There are 1,450 craft villages distributed across 56 provinces in the rural areas of Vietnam, and they generate about 774,000 tons of non-hazardous industrial solid waste per year. Fifty-four percent of this waste comes from the three northern provinces of Ha Tay, Bac Ninh, and Ha Noi, and 68 percent of all waste comes from the North (Figure 2).

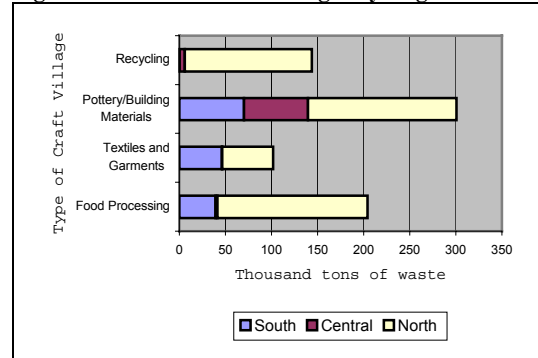
Hazardous waste

Total hazardous waste generation in 2003 was about 160,000 tons per year. The vast majority, 130,000 tons/yr, was from industry. Hazardous healthcare waste from hospitals, clinics, and sanitariums accounted for about 21,000 tons/yr, while agricultural sources accounted for 8,600 tons/yr.²



Source: MOI, Survey 2000-2003

Figure 2. Waste in Craft Villages by Region



Notes: Excludes 23,000 tons of waste generated a year by a variety of other types of craft villages. Source: INEST, 2003.

¹ Le Minh Duc and Nguyen Thi Kim Thai, 2004 consultant reports submitted to WB

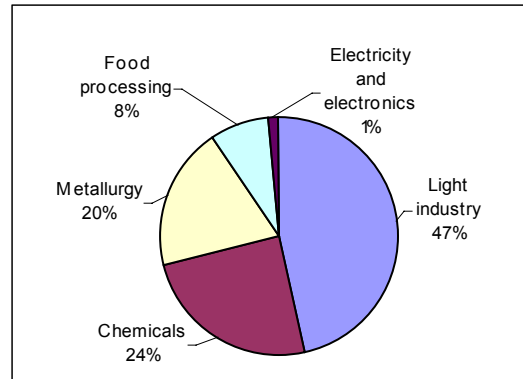
² Based on VEPA 2004 preliminary survey results and compiled from various sources by VEM team.

The South produces the majority of industrial hazardous waste. About two-thirds (64 percent) of the hazardous waste is generated in southern Vietnam, with Ho Chi Minh City accounting for half of this. The next highest source is the North (31 percent). The largest producers of industrial hazardous waste are light industry (47 percent), followed by chemicals (24 percent), and metallurgical industries (20 percent) (Figure 3).³

Every province produces a significant quantity of hazardous healthcare waste. Approximately 20 percent of the general healthcare waste is hazardous. While the metropolitan areas of Ho Chi Minh City and Hanoi account for 23 percent of the hospital capacity in the country, the hospital system is well established throughout the country, with each of the provinces having a minimum capacity of 500 beds. The areas around Ho Chi Minh City, Thanh Hoa Province, and Hanoi City⁴ generate about 6,000 tons of hazardous healthcare waste each year. Other provinces generate smaller amounts, from 0.2 to 1.5 tons daily.

Agricultural operations produce large amounts of toxic pesticide residues and pesticide containers each year. The 8,600 tons of hazardous waste from agriculture is predominantly comprised of pesticides and pesticide containers, much of which is banned and illegally imported. The largest concentration of pesticide use is in the Mekong River Delta. In addition, there are 37,000 tons of confiscated agricultural chemicals that have been stockpiled and need urgent treatment.

Figure 3. Sources of Industrial Hazardous Waste

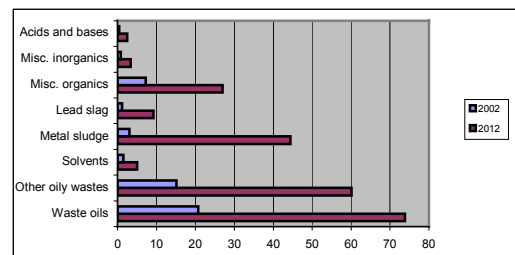


Source: VEPA, 2004, ongoing survey.

Box 1. Industrial hazardous waste in the Southern Focus Economic Zone

The Southern Focus Economic Zone, which comprises Ho Chi Minh City, Dong Nai, Binh Duong, and Ba Ria Vung Tau, generates most of the industrial hazardous waste in the country. The volume was estimated to be 73,275 tons in 2002 and could quadruple to 308,775 tons by 2012. The major types of hazardous waste found in the SFEZ were waste oils, primarily from the transportation manufacturing and maintenance sector (87 percent), and other oily waste from a variety of sectors, including the oil and gas sector (22 percent), and the footwear (58 percent), textile (12 percent) and leather (13 percent) industries.

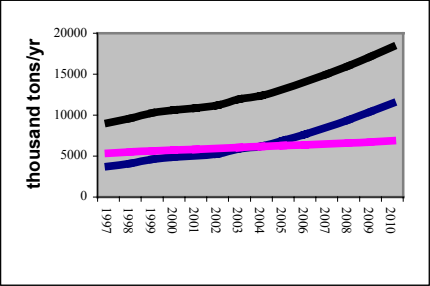
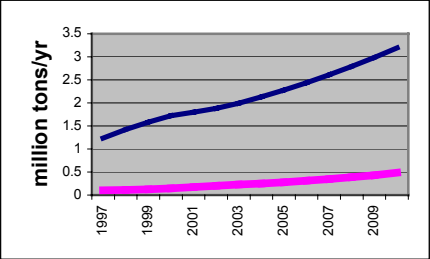
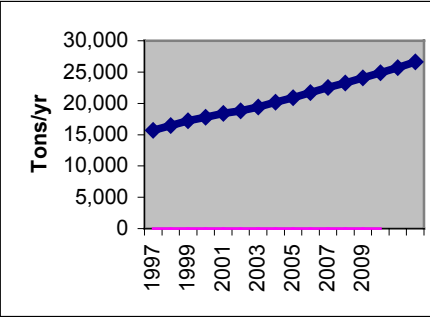
Estimated hazardous waste generation by waste category in the SFEZ (thousand tons per year)



Source: NORAD, 2003, Masterplan for hazardous waste management in HCMC, Dong Nai, Binh Duong and Ba Ria – Vung Tau (excludes packaging and container waste)

⁴ The three most populated provinces and cities in Vietnam and therefore have the largest number of hospital beds

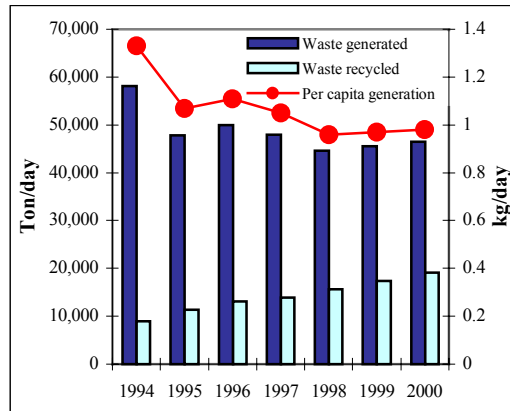
WASTE GENERATION

	Trends in Vietnam (see methodology section for details)	Effects on Waste Generation	Waste Projections (see methodology section for details)
Increasing consumption	<p>Rapid growth Incomes have more than doubled in the last 10 years and have grown an average of 5 percent annually between 2000 and 2002.</p> <p>Consumption grew 8 percent in 2002 and increased an average of 5 percent annually from 1992 to 2002.</p>	<p>Increased municipal waste generation due to increased consumption and increasing proportion of packaging waste.</p> <p>Increase in amount of plastics and toxics due to more modern products.</p>	<p>Municipal Waste</p>  <p>2004: 12 millions tons (50 percent urban)</p> <p>2010: 20 million tons (63 percent urban)</p>
	<p>Population growth Population growth rate is currently a modest 1.3 percent annually, which should result in an increase from the current population of 82 million (2004) to 89 million by 2010.</p>	<p>Population growth is expected to contribute to municipal waste generation, but to a lesser degree than the growth in income and consumerism.</p>	
Urbanization	<p>Rapid Growth Urbanization in Vietnam is rapid and is expected to increase from the current level of 24 percent to 33 percent in 2010, resulting in 10 million more people in urban areas.</p>	<p>The growth in urban areas is expected to be the main driver for increases in municipal waste generation. Waste is expected to increase from non-household sources such as shops, restaurants, hotels and offices, and as a result of improved incomes and purchasing power.</p>	<p>Industrial Waste</p>  <p>2004: 2.2 million tons (6 percent hazardous—130,000 tons).</p> <p>2010: 3.2 million tons (15 percent hazardous—500,000 tons).</p>
Industrialization	<p>Rapid Growth Industrial growth has averaged 7 percent since 2000 and is the main driver for growth, accounting for 38 percent of Vietnam's GDP growth in 2002. Non-state owned industries have grown faster than those that are SOEs owned, yet the state sector still dominates industrial output.</p>	<p>Industrial waste production is expected to increase rapidly in a strong economy. The cleaner, more efficient processes anticipated in the growing non-state sector would be expected to temper the growth in total amount of waste produced. However, growth in hazardous-waste-intensive industries such as chemical products and electronic products is expected to increase the proportion of hazardous waste generated.</p>	<p>Hazardous Healthcare Waste</p>  <p>2004: 21 thousand tons</p> <p>2010: 25 thousand tons</p>
Modernization of healthcare	<p>Moderate Growth Growth in the number of beds in hospitals has been moderate (1.4 percent annually), while the number of beds in regional polyclinics, clinics, and sanitariums has decreased.</p> <p>Investment in modernization of equipment has been significant. Between 1997 and 2001, \$150 million was spent on new medical equipment and \$29 million on upgrading equipment.</p>	<p>While the number of patients is not expected to increase as rapidly as in the past, hazardous healthcare waste will increase more rapidly as a result of the adoption of new medical techniques, use of more disposable medical equipment such as plastic syringes, and an increase in tests, therapies, and operations undertaken for each patient.</p>	

Acting now to reduce waste generation could save on future disposal needs. Given the anticipated rapid growth in waste in Vietnam, programs to encourage lower waste generation in households, businesses, industries, and hospitals could significantly reduce the waste-disposal burden in the future. By promoting awareness and providing economic and other incentives, experience from other countries has shown that the amount of waste can be reduced significantly (Box 2). For example, a 10-percent reduction in waste generation would result in an annual savings on disposal of approximately VND 200 billion for municipal waste and VND 130 billion for hazardous healthcare waste.

Cleaner industrial production is another way to reduce the cost of waste disposal. Since being introduced in Vietnam 10 years ago, the Cleaner Production (CP) approach to waste reduction in industries has demonstrated its ability to produce both economic and environmental benefits (Box 3).

Box 2. Using Economic Incentives to Reduce Waste South Korea introduced a volume-based fee system in 1995, in which charges for waste management services are based on the volume of waste generated per household. The initiative is based on the “polluter pays” principle, and promotes a reduction of waste generation at the source. The system has played a significant role in reducing the volumes of waste generated by promoting recycling, while it has also helped to cut municipal waste management costs.



Source: Ministry of Environment, Republic of Korea

Box 3. Demonstrating Cleaner Production in Vietnamese Industries

The Vietnam National Center for Cleaner Production is leading the way in promoting CP, by conducting assessments of more than 50 companies throughout the country between 1998 and 2003 (see table below).

Benefits from Cleaner Production in Vietnamese Industries

Production Characteristics	Type of Industry	
	Wool Manufacturing Company	Paper Recycling Company
Annual production output	Over 500,000 sweaters, 300,000 socks, 85 tons dyed wool	1,500 tons of paper
Cleaner Production actions taken ¹	Recycle cooling water and condensate for heat savings	Replace boiler fan and recycle condensate; recover paper fiber from wastewater
Annual coal savings	140 tons (26%) ²	124 tons (16%) ²
Annual coal ash reduction	42 tons	37 tons (31%) ³
Annual net financial gain	94 million VND	90 million VND

Notes: (1) Negligible investment required for these measures, therefore payback period was immediate. (2) Percentage of the amount of original production input. (3) Percentage of the amount of original waste output. Source: INEST, 2003

Waste handling in Vietnam is mainly carried out by URENCOs, which are responsible for the collection and disposal of municipal waste, including domestic, institutional, and in most cases also industrial and healthcare waste. Although in theory industries and hospitals should be responsible for their waste—and the government’s role should be developing, implementing, and enforcing regulations—such arrangements are not yet in place in Vietnam. Due to the limited information on the practice of handling other wastes, this section mainly discusses the operations of URENCOs related to municipal waste.

Waste Collection

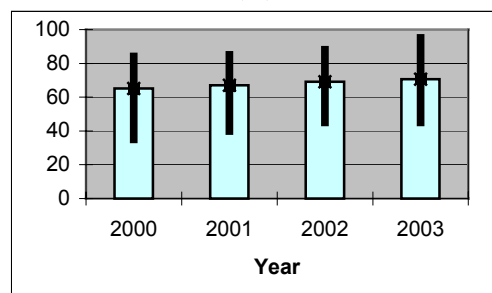
Average collection rates are improving, but remain low in many cities. The national average collection rate of municipal waste in urban areas rose from 65 percent to 71 percent between 2000 and 2003. Collection rates are typically higher in larger cities, and range from 45 percent in Long An to 95 percent in Hue City in 2003. On average, cities with populations greater than 500,000 collect 76 percent of their waste, while the rate decreases to 70 percent in cities with 100,000 to 350,000 people (Figure 4). In rural areas, collection rates are particularly low. Given the remoteness and the lack of access to rural localities, waste is only collected from 20 percent of the highest income rural households (Figure 5). In urban areas, there is often a lack of service coverage of settlement areas, temporary housing areas, and city outskirts, which are typically occupied by low income households.

New initiatives are filling the gaps in municipal waste collection services. Community-based groups and private companies have been encouraged to work with the local SWM authorities as part of the GOV policy on socialization of environmental protection. Some experimental models that are being tested have shown positive outcomes, but cited the need for improvements in management policies and practices. Villages and communities in Thai Binh Province, for instance, are financing solid waste management teams that collect and dispose

waste in allocated disposal sites. The cost of equipment and workers’ salaries is covered by fees collected from households. Waste management operations are supervised through a communal consultation process. In Lang Son, in northern Vietnam, a private company with 250 workers is collecting and disposing waste from areas not serviced by the local URENCO. Other examples include cooperatives for environmental services in Bac Giang, HCMC, and Hanoi.

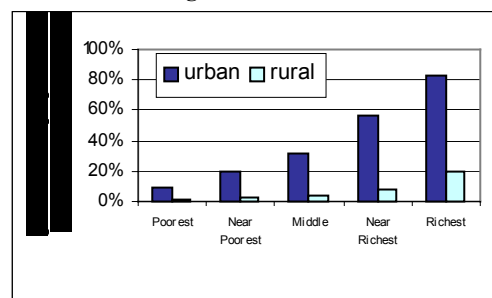
Most hazardous healthcare and industrial waste is mixed with general waste at collection. Few data are available regarding collection and disposal practices at healthcare and industrial facilities. The majority of these facilities have contracts with local URENCOs for the collection of their waste. Even if hazardous waste is separated from general medical waste at the hospital wards and industries, it is commonly re-mixed with common waste prior to collection by URENCOs. Healthcare facilities that operate incinerators treat their hazardous healthcare waste on-site, and the treated waste and incinerator ash are later collected with other

Figure 4. Average Municipal Waste Collection Rates (%)



Note: Thin black bar represents the range of collection rate
Source: Consultant Data Group Survey, 2004

Figure 5. Percentage of Urban and Rural Households Receiving Waste Collection Services



Source: 2003 Vietnam Household Living Standard Survey

Box 4. Economic Benefits of Good Waste Management: Tourism and Solid Waste

Tourism is an important growing industry in Vietnam, where 1.5 million visitors are expected in 2004, generating about \$1.6 billion in national tourism-related revenues.

Poor solid waste collection can affect long-term tourist arrivals, especially in places that rely upon their natural aesthetics to attract tourists. For example, solid waste often litters popular beaches in Danang, a city that in 1997 accounted for 15 percent of total tourism revenues nationally. It was estimated that economic development in Halong and Danang, where cleaner beaches and bathing waters are expected to contribute to tourism, will be promoted through environmental improvements. Efforts are now being made to reduce the littering and to purchase beach cleaning equipment. It is envisaged that improved solid waste disposal and other environmental investments would improve economic growth from tourism by 42 percent in Danang and Quang Ninh.

Sources: World Bank, Three Cities Sanitation, 2000; Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) <http://www.pemsea.org/abt>

Waste Treatment and Disposal

Forty-nine out of 439 national “environmental hotspots” deemed by MoNRE to pose high environmental and human risks are poorly operated landfills and open dumps. Prime Minister’s Decision No. 64 requires these sites to be treated by 2007, but funding is needed. For example, it is estimated that around VND 300 million will be required for the closure of Ba Hoa landfill (Quy Nhon city) in accordance with the current legislation. While efforts have been made to improve municipal waste management, information on the treatment of hazardous waste (especially industrial waste) is lacking, and there is an urgent need for better management.

Municipal Waste

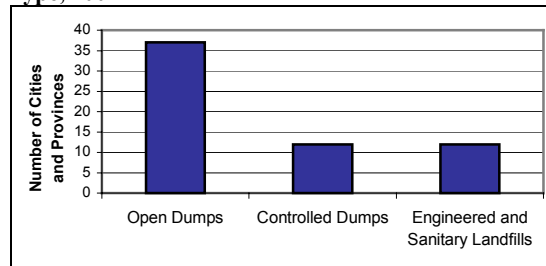
New landfill facilities are needed across the country. Like other countries in Southeast and South Asia, open and controlled dumps are the dominant form of waste disposal in Vietnam (Figure 6). Only 12 out of 61 cities and provincial capitals have engineered or sanitary landfills; most were constructed in the past four years. Of the 91 landfills across the country, only 17 are sanitary landfills. The development of waste treatment and disposal systems, which includes landfills, is a government priority, but due to the lack of financial resources the government is constructing most sanitary landfills with ODA funding (Map Urban Municipal Solid Waste).

Self-disposal is common in areas with no collection and disposal services. Households that do not have access to collection and disposal services use their own means of waste disposal. This often results in waste being dumped in nearby rivers or lakes, or discarded at sites near homes (Figure 7). Other methods of self-disposal include burning or burying waste. All of these methods cause serious environmental damage and may endanger human health.

Many landfills and dumps are posing environmental threats to local populations. Poorly operated landfills and dump sites cause a multitude of environmental problems for surrounding communities, including

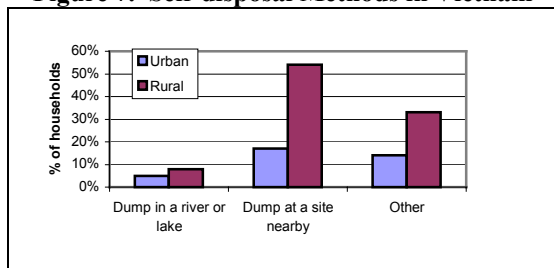
contamination of ground and surface water by untreated leachate, emissions of airborne pollutants, and the spread of odors, flies, mosquitoes, rodents, dust, and noise. The Dong Thanh landfill in Ho Chi Minh City, for example, is affecting 400 households in its vicinity, both through losses of agricultural income and health problems. The average incidence rate of skin, digestive, and respiratory disease was 58 percent. A survey of well-water quality in the vicinity showed that 16 percent of wells did not meet the national standards for microbiological parameters and 100 percent did not meet physico-chemical standards. The pH level was found to be as low as 4, indicating high acidity.⁵ The quality of the leachate discharged from some sampled landfills shows a high level of contamination. The leachate should not have been discharged without treatment (Table 4).

Figure 6. Number of Waste Disposal Facilities by Type, 2004*



(* For provinces and cities with more than one type of disposal facility, only the best facility is counted. Source: Consultant Data Group Survey, 2004

Figure 7. Self-disposal Methods in Vietnam



Source: Vietnam Household Living Standards Survey, 2003

⁵ VNCC, 2003. EIA for Dong Thanh landfill closure, submitted to CITENCO

**WASTE HANDLING
COLLECTION, TREATMENT AND DISPOSAL**

Table 4. Quality of leachate from selected landfills in Vietnam

Name, landfill location	BOD5 (mgO₂/l)	SS (mg/l)	Coliform (MPN/100ml)
Nam Son, Hanoi	2,000-30,000	200-1,000	1,500,000
Hiep Thanh, Binh Duong	6,200	1,860	240,000
Go Cat, HCM city ¹	275-412	244-4,311	406,000
Binh Duc, Long Xuyen	9,330	3,140	570,000
National standards²	100	200	10,000

Source: CENTEMA 04-08/2003; CEREC2002

1. Samples taken with time lag
2. Under TCVN5945-1995, this standard for Water Class C means not acceptable for any usage purpose. Wastewater with concentrations higher than these limits is not allowed to be discharged to the environment

Table 5. Safe and Unsafe Disposal Practices

		Operational Procedures	Environmental Controls
UNSAFE	Open Dump	No formal operational procedures. Waste pickers commonly work on site.	None
	Controlled Dump	Basic waste accounting. Waste pickers commonly work on site.	Limited or none
SAFE	Engineered Landfill	Basic waste accounting; waste placement, cover and compaction procedures; fencing and staff on site. Waste pickers may have controlled access to the site.	Some environmental monitoring and environmental controls such as liner, drainage, leachate treatment, and gas ventilation. Controls may be dysfunctional or not in use
	Sanitary Landfill	Waste accounting; waste placement, cover and compaction procedures; fencing and staff on site. No waste pickers working on the site.	Regular environmental monitoring. Environmental controls, include liner, drainage collection, leachate treatment and gas ventilation.

Hazardous Waste

Unsafe methods of handling and treating hazardous waste predominate. The current monitoring and enforcement of environmental standards for industries, waste transporters, and waste treatment operators is extremely weak. This provides few incentives for industries to undertake proper treatment and presents a major barrier to the safe operation of current and future treatment facilities. It is exacerbated by the lack of guidelines, training, and awareness provided to industries on hazardous waste issues, despite a number of laws and regulations for hazardous waste management (Annex 1). At present, while the treatment of industrial waste lies with industries and IZMBs, agricultural chemicals are the responsibility of government environmental authorities, which requires funding from the central government budget. Healthcare waste is the responsibility of MOH, which is operating a national program for hazardous healthcare waste treatment.

Treatment of industrial hazardous waste from industrial zones getting more attention.

There are plans for development of several centralized facilities in the country, such as for the Le Minh Xuan industrial zone in Ho Chi Minh, and for industrial zones in Dong Nai by the IZMB for industries around Viet Tri City. In Hanoi, a treatment complex for industrial waste was put in operation in 2004 as part of the Nam Son landfill. Most industrial hazardous waste from larger industries is either treated onsite by simple furnaces or industrial boilers, or by specialized small private enterprises, which recycle part of the waste and use locally made and cheap burning technology at low temperature. As a result, the risk of posing further environmental impacts from air emissions and ash is quite high. For SMEs, there are even fewer options for proper treatment of industrial hazardous waste. The lack of combined treatment facilities has led industries, especially SMEs, to practice a variety of unsafe methods of treatment and disposal, including co-disposal with municipal waste, storage onsite, or sale to recyclers. The Holcim Vietnam Company in Kien Giang is

proposing to use cement kilns to treat hazardous waste.

Common Industrial Hazardous Waste Management Practices in Vietnam
Disposal with non-hazardous waste in municipal landfills.
Collection by licensed hazardous waste management company.
Storage on site.
Treatment and disposal on-site.
Discharge with wastewater effluent.
Reuse or sale to recyclers or as inputs to other industries.

Source: Information from a survey of waste management companies, industrial zone authorities and waste generators in SFEZ. Norad, 2002.

Roughly half of agricultural chemical wastes stockpiled in storage were treated in 2002.

Vietnam uses incineration and chemical techniques to treat its agricultural chemical wastes. In 2002, 42 percent of the country's stored solid agricultural chemical wastes and 60 percent of the liquid agricultural chemical wastes were treated. The cost for chemical treatment (mainly by adding lime) ranges from VND 35 million to 40 million per ton, but this still requires additional post-treatment safe disposal. A better but more costly method (VND 50 million/ton) uses specialized kilns. However, the treatment of emission gases—such as Dioxin and Furans—is unsatisfactory. Despite these efforts, there are still significant amounts of illegally stored chemicals, primarily in agricultural areas, and substantial traffic in banned chemicals, which continuously add to the existing volumes of waste that must be treated (Box 5). A successful trial by the Holcim Company—using a cement kiln for treating 40,000 tons of pesticides at a reasonable cost—has led to an EIA approval for the company to treat another 10 types of hazardous waste.

Incineration capacity for hazardous healthcare waste has increased but is not being fully utilized.

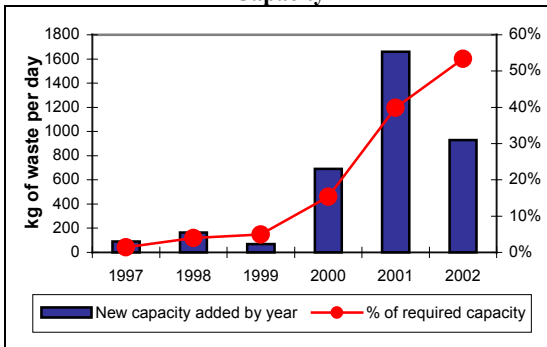
Vietnam has built 43 modern medical waste incinerators since 1997, bringing its total capacity for incineration of hazardous healthcare wastes up by roughly 50 percent—to 28,840 kg/day by 2002. Average investments are on the order of VND 300 million for locally designed incinerators, and VND 3 billion for imported incinerators (Figure 8). Unfortunately, existing

WASTE HANDLING COLLECTION, TREATMENT AND DISPOSAL

incineration infrastructure is underused, and poorly treated hazardous healthcare waste poses high risk. Most of the international and local investments on incineration have focused on equipment, while hospitals are left to finance the operating costs of incineration (training, fuel, personnel) from their existing budgets. Since hospitals do not have sufficient financial resources to operate incinerators, hazardous healthcare waste is often not properly treated, and is disposed mixed with general medical waste (Box 6). In contrast, the new Cau Dien incinerator, which is centralized and properly operated, helps bring up the rate of hazardous healthcare waste treatment in Hanoi from 33 percent in 2003 to more than 90 percent in 2004.

There is a need to develop a coherent and consistent approach to healthcare waste management. It is important to find a suitable mix of technology, operational responsibility, and finance that is appropriate for the different regions and situations in Vietnam. Incineration is the most popular treatment method, although the potential risk of air pollution, including dioxin and furan emissions, is well known. Other methods—such as steam and microwave sterilization—are under consideration as practical applications.

Figure 8. Hazardous Healthcare Waste Incineration Capacity



Source: Ministry of Health, 2004 Dept. Planning and Finance

WASTE HANDLING COLLECTION, TREATMENT AND DISPOSAL

Box 5. Persistent Organic Pollutants¹ (POPs) and agrochemicals —A latent threat to human health and to the environment

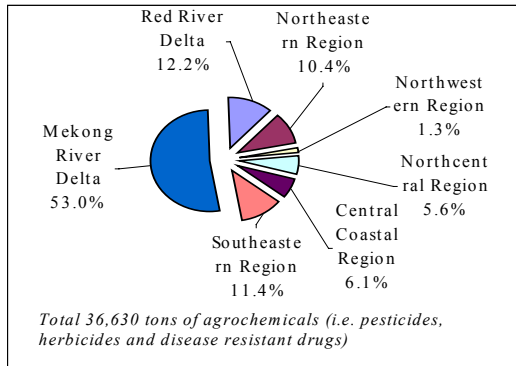
There is a large stockpile of confiscated agricultural chemical wastes.

Agricultural chemicals include pesticides, herbicides, fertilizers, and veterinary drugs. Most of the confiscated wastes are either obsolete (out-of-date) or banned chemicals. The government estimates that there are 100 storage sites of banned and obsolete pesticides, 26 of which are classified as serious polluters.² The total amount of stocked agrochemicals could be as high as 37,000 tons, of which up to 53 percent are stored in the Mekong River Delta (see chart).³ In addition to the stockpiles, a survey of 39 provinces found that 730,200 unlabeled agrochemical containers—including bottles, metal and plastic jugs—have been improperly discarded or are being reused at great risk to the population.³ The main sources of these chemicals are from smuggling operations and poorly documented imports.

POPs-pesticides have been banned in Vietnam since 1992. However, an illicit market for pesticides exists. Certain POPs are still being used² and many POPs-pesticides are stockpiled.

Dioxins and furans (D&F). In certain regions of the country, war chemicals are sources of critical hazardous waste as a result of the use of as much as 72 million liters of defoliants (herbicides) during 1961–71 (Agent Orange, white, green, and purple). The persistence of D&F in soils ranges from 25 to 100 years, making them a long-term threat to the local population.⁴ In addition to this amount, 9 million kilograms of CS (a chemical affecting the sight and nerve systems) were used, and a large amount is stockpiled in many areas. A survey in 1999-2001 found at least nine storage areas with hundreds of barrels containing CS.³

PCBs. PCBs are formally banned, but oil from old transformers is reportedly mixed with other oils for use as fuel in some industries, and discarded equipment is found in open-air dumpsites.² The amount of oils possibly contaminated with PCBs in Vietnam could reach 19,000 tons; 70 percent are located in the northern region of the country.²



Note: ¹ POPs include pesticides such as *aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene*; industrial chemicals such as *PCBs*; and unintentional by-products of combustion, including *dioxins and furans*. All POPs share common chemical characteristics—high persistence, high mobility, and high toxicity—and have known impacts, including birth defects, cancers, and dysfunctional immune and reproductive systems.

²UNDP, *Enabling Activity proposal*, 2001.

³WB consultant report, 2004 – Source VEPA

⁴Agency for Toxic Substances Disease Registry, U.S. Dept. of Health and Human Services, Registry, U.S. Dept. of Health and Human Services, 1998

Box 6. Hazardous healthcare Waste Incinerators are not Operating at Full Capacity

Although Vietnam has the capacity to incinerate more than 50 percent of its hazardous healthcare waste, the majority of incinerators are not operating at full capacity due to financial difficulties. Many incinerators operate only twice a week or 4–6 hrs per day. In Hanoi, for instance, where the installed incineration capacity is as high as 70 percent (3,600 kg/day), the amount of hazardous healthcare waste that was actually incinerated in 2003 varied from 18 to 33 percent of the total. A few hospitals have addressed the problem of lack of financial resources by introducing a special user fee of 1,000 VND per bed per day to cover incineration costs (e.g. Hanoi Tuberculosis Hospital, Vinh Children's Hospital). Individual hospitals in nearby areas are also being encouraged to build shared incineration facilities, so that operation costs can be divided between facilities.

Reuse and Recycling

Reuse and recycling is already common practice in many households. A study of households in Hanoi in 1998 found that people reuse items that would otherwise become household wastes, either within the home by giving the items away, or by selling them in second-hand markets and repair shops.⁶ Households routinely separate recyclable wastes such as metals and paper for sale to itinerant buyers, or sell them directly to local depots. Reusable and recyclable wastes are also being separated by waste pickers, and then sold to the recycling business. Promoting source separation for increased recycling throughout the country would likely lead to significant savings in municipal waste disposal costs.

Vietnam's potential for recycling is high. Little information is available on the national amount of waste recycled in Vietnam every year. However, it is known that approximately 20 percent of the municipal waste in Hanoi is recycled. Although this rate is higher than that of other East Asian cities such as Bangkok, Manila and Beijing, there is a potential to recycle at least two times more, as shown by rates in Singapore, Seoul, and Hong Kong (Table 6). For municipal wastes, the government can subsidize recycling and treatment facilities, and it is important to build up municipal capacity to recycle wastes. The private sector should be encouraged to manage and recycle industrial and hazardous wastes, which are usually not managed by municipalities. Eco-industrial parks and waste exchange options could minimize the costs for industrial and hazardous wastes (Box 7)

The informal recycling sector has a significant financial impact on local economies. The informal sector collects the majority of the recyclable and reusable waste in urban areas. In 1995, the value of recyclable materials traded by the informal sector in Ho Chi Minh City was estimated to be VND 135

billion, which amounted to VND 15 billion less than the city's total budget for waste management that year.⁷ In Hai Phong, the value of plastics, paper, metal, and glass traded was estimated to be VND 33 billion in 2000.⁸ The most recyclable materials were plastics (valued at VND 11 billion), followed by paper (VND 10 billion), and metals (VND 8.5 billion). A 1996 survey of the informal sector in Hanoi estimated that 18 to 22 percent of all waste was being diverted from the landfill by the informal recyclers. Given that roughly 1.4 million tons of waste are produced in Hanoi every year, savings on disposal costs from recycling currently range from VND 38 billion to 47 billion.

The Decision 03/2004 of MONRE allowing the import of waste as materials for domestic production has facilitated the local recycling business to tap recyclable materials from the wider region. However, it is critical to strengthen monitoring and enforcement to ensure that the imported waste will be handled in compliance with environmental regulations.

Table 6. Recycling rates of municipal waste in Asian cities

<i>City</i>	<i>Recycling rate</i>
Hong Kong ¹	36%
Seoul ²	45%
Singapore ³	39%
Manila ⁴	13%
Bangkok ⁵	15%
Beijing ⁶	<10%
Hanoi ⁷	18-22%

Source: (1) HK Environment protection Dept.; (2) Yoon, 2002; (3) UNESCAP; (4) Philippines Environment Monitor; (5) Thailand PCD Recycling study, 1998; (6) Inst. Global Env. Strategies; (7) Di Gregorio 1997, 1999.

⁶ C. Ferguson (1998) The Household Reuse Economy in Hanoi, Vietnam: A Conceptual Model. University of Toronto

⁷ CENTEMA 2002.

⁸ JICA (2001) The Study on Sanitation Improvement Plan for Haiphong City in the Socialist Republic of Vietnam

WASTE HANDLING REUSE, RECYCLING AND RECOVERY

At least 80 percent of non-hazardous industrial waste from selected industries is recyclable and the potential savings are high.

Although there have been no national studies on the amount of industrial waste recycling, individual case studies suggest that industrial waste recycling is widespread. For example, a 2002–03 survey of 29 textile manufacturing enterprises found that waste from 72 percent of the sampled factories could be recycled.⁹ The survey also estimated that roughly 825,000 tons of non-hazardous industrial waste are generated by the six industries listed in Figure 9. If each industry recycled 50 percent of their potential, the savings in disposal costs would amount to approximately \$3.5 million.¹⁰ Additionally, it has been shown that artisans and workers at craft villages are very successful at recycling, as they reuse over 90 percent of their solid, recyclable wastes (Table 7).

Box 7. Eco Industrial Parks and Waste Exchanges

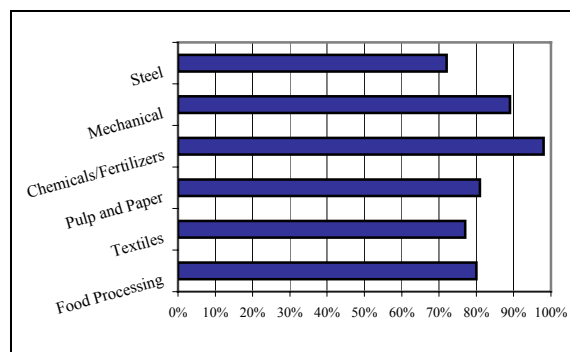
Bien Hoa I Industrial Zone was established in 1963 as one of Vietnam's first industrial zones. It contains 88 enterprises from eight industrial sectors. Fourteen of these enterprises reuse their own solid waste by-products (such as metal shavings, glass, and plastic containers) in their manufacturing lines, and five enterprises exchange their wastes with other factories in the industrial zone. Many of the factories also sell their wastes to recycling operations outside the industrial zone. Efforts are under way to establish a waste exchange center that would maintain a data base of solid waste by-products available within the industrial zone. Solid waste exchanges are one of the important activities that characterize enterprises in eco-industrial parks. Other key characteristics include exchanges and internal reuse of liquid wastes and waste heat, and minimization of material and energy inputs. *Source: Environnemental Protection Magazine, No. 1+2/2004*

Table 7. Recycling in Craft Villages

Materials recycled	Inputs to recycling production (tons/year)	Products (tons/year)	% recycled
Plastics	25,200	22,900	90.9
Paper	51,700	45,500	80.0
Metals	735,000	700,000	95.2
Total	811,900	768,400	94.6

Source: INEST, 2003. Project KC08-09

Figure 9. Potential for recycling industrial waste



Note: The sample size varies from 8-49 factories per sector. Source: MoI 2002-2003 survey.

⁹ Le Minh Duc, 2004. Consultant report based on MOI survey 2002-2003, submitted to WB

¹⁰ WB staff estimate based on data from 9 URENCOs, assuming the cost for disposing non-hazardous industrial waste is \$10/ton, the same as for municipal waste.

Composting and recovery

Composting is potentially a very useful form of recycling of organic waste to produce a clean soil conditioner, and could help to increase the recovery rate of recyclable materials. This could contribute to a more efficient municipal solid waste system, but it is not yet widespread for a number of reasons, including inadequate attention to the biological process requirements; poor feed stock and poor quality of the fertilizers; and poor marketing experiences. To support composting, the development of a strong market for intensive agriculture is needed (Table 8).

The effectiveness of centralized composting facilities could increase considerably.

Centralized composting facilities are large-scale waste management plants that draw on an urban area for their organic waste supply. Several of these facilities are currently operating in Vietnam (Table 8), but no data are available on their cost-effectiveness. The compost produced at these plants often contains broken bits of glass and metals, and is therefore difficult to sell.¹¹ Since centralized composting plants in other Asian countries have failed when relying on mixed municipal waste as their main feedstock,¹² source separation initiatives are being tested in Vietnam. In Hanoi, for example, wastes from markets or separated household wastes from test areas are being used as clean sources of organic matter. (Box 8). In addition, without successful composting, efforts to expand or sustain source separation will be less convincing, although it can still be targeted to recyclable materials and general awareness purposes.

Old landfills have been used as sources of income.

Organic waste decomposes naturally in landfills and, if it is not contaminated by glass, heavy metals, or other pollutants, can be recovered for use as

a soil conditioner. A private enterprise has extracted waste from the Dong Thanh landfill in Ho Chi Minh City and separated out organic matter, which was then sold as a soil conditioner for 400 VND/kg.¹³ This practice has been banned in Vietnam due to its potential health and environmental impacts.

Box 8. Source Separation for Composting

In Gia Lam, a suburban district of Hanoi, the Ministry of Science and Technology is supporting a pilot project on source separation of household wastes being conducted by Gia Lam Urban Environmental Enterprise. Over 13,000 households from Sai Dong, Duc Giang, and Yen Vien communes are participating in the project, which started in 2001. Waste is being separated in two categories, organic and inorganic (sometimes referred to as “wet” and “dry”). Wet waste is transported to Hanoi’s Kieu Ky dumping site for composting. The program is successful, as only about 5 percent of the waste sent for composting contains inorganic waste. Other similar initiatives in three villages of Trau Quy Commune in Gia Lam District have shown that between 90–95 percent of households are willing to separate their wastes and that 75–85 percent of the waste is being separated correctly. Residents of urban areas seemed to be less enthusiastic about source separation. A similar effort carried out in Hoan Kiem, a downtown area, showed only 74 percent of the 7,000 residents were satisfied.

Source: Dao Chau Thu, 2004. Consultant report submitted to WB ; Nguyen Thi Thuc Thuy, 2004. Report on Source separation in Vietnam

¹¹ Nguyen Thi Kim Thai, 2004. Consultant report submitted to WB.

¹² Hoornweg et al. (1999) Composting and its applicability in developing countries.

¹³ VIWASE (2002) Master Plan for Solid Waste Management in Ho Chi Minh City up to 2020.

**WASTE HANDLING
WASTE REUSE, RECYCLING AND RECOVERY**

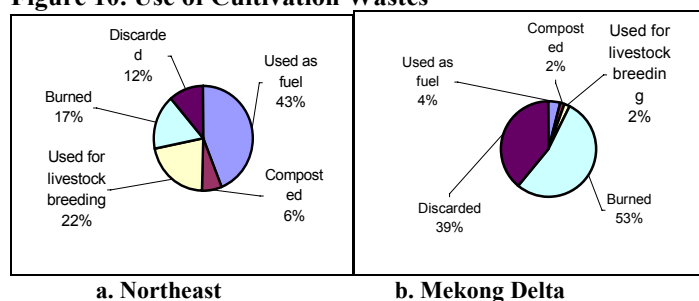
Table 8. Status of selected Centralized Composting Facilities in Vietnam

Location of Facility	Capacity (tons/day)	Opened	Source of Organic Waste	Status
Cau Dien, Hanoi ¹	140	1992; expanded in 2002	Market and street waste	Operating. Sells three products with different quality for 800, 1200, and 2000 VND/kg.
Nam Dinh City ¹	250	2003	Mixed municipal waste	Operating. Compost provided to farmers free of charge.
Phuc Khanh, Thai Binh ¹	75	2001	N/A	Operating.
Viet Tri City, Phu Tho Province ¹	35.3	1998	N/A	Operating. Sells 3 products with different quality for 200, 250 and 900 VND/kg
Hoc Mon, Ho Chi Minh City ¹	240	1982; closed 1991	Mixed municipal waste	Closed due to difficulties in selling compost
Phuc Hoa – Tan Thanh, Baria-Vung Tau ¹	30	N/A	N/A	Operating.
Trang Cat, Hai Phong City ²	50	2004	Septage, sewers, mixed municipal waste	Trial period.
Thi Phuong, Hue (with seraphin technology) ¹	159	2004	Mixed municipal waste	Operating. Sells compost for 1100 VND/kg to coffee and rubber farmers.

Sources: (1) Nguyen Thi Kim Thai, 2004. Consultant report submitted to WB; (2) WB Three cities sanitation project

Agricultural cultivation wastes are reused for several different purposes. In rural areas, most wastes from agricultural cultivation are reused. However, the nature of reuse varies from the North to the South, as shown in Figure 10. In the northern provinces, more cultivation wastes are used as fuel for cooking and also for heating, primarily due to the colder climate. Local procedures have been developed for reusing waste from rice straw, corn stems, coconut trees, sugar cane, cashew nuts, and other products.

Figure 10. Use of Cultivation Wastes



Source: NEA, 2000

Composting and recovery of landfill gas can reduce air pollution, helping address global warming. Landfill gas is produced by the degradation of organic matter in waste and contains approximately 50 percent of methane, a potent greenhouse gas (Table 9). Landfill gas can be collected and used as a fuel for electricity generation or industrial processes. Composting can also reduce landfill gas emissions by removing organic matters that would otherwise degrade under landfill conditions. The reductions in greenhouse gas emissions from these activities are eligible to receive “carbon credits” under the Clean Development Mechanism of the United Nations Framework Convention on Climate Change. These credits can be sold in international markets, resulting in revenues for landfill operators (Box 9). According to the WB Carbon Finance Unit, carbon finance has the potential to increase the Internal Rate of Return (IRR) of waste management projects by 5 to –10%. This is compared to biomass (2–7%), gas flaring in the petroleum industry (2–4%), energy efficiency and district heating (2%), bagasse (0.4–3.6%), wind power (1–1.3%), and hydropower (0.8–2.6%)

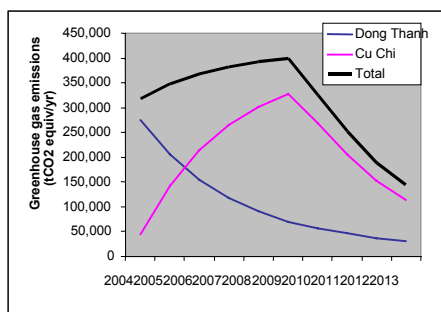
Table 9. Conditions Suitable for Recovery of Landfill Gas.

Condition	Preferable	Not preferable
Amount of waste	>1,000,000 tons of waste in place	<500,000 tons of waste in place
Depth of landfill	>10 m	<5 m
Disposal practices	Sanitary landfilling, waste compaction, daily cover and leachate drainage system	Open dumping of waste, fires, and high moisture
Waste pickers	No waste pickers living on site	Waste pickers in contact or interfering with landfill gas equipment

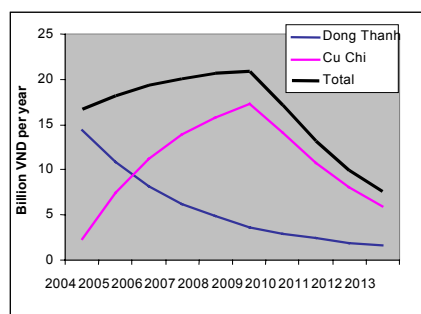
Box 9. Providing global and local benefits through better landfill management

Ho Chi Minh City is considering the development of two landfill gas recovery projects. The first is in the Dong Thanh landfill, which was closed in 2003, and the second in Cu Chi landfill, the new waste disposal site for the city once Dong Thanh is closed. Over a 10-year period, it is estimated the project could reduce the equivalent of 3 million tons of CO₂ emissions, generate roughly 301 GWh of electricity, and result in 164 billion VND in revenues from the sale of carbon credits.

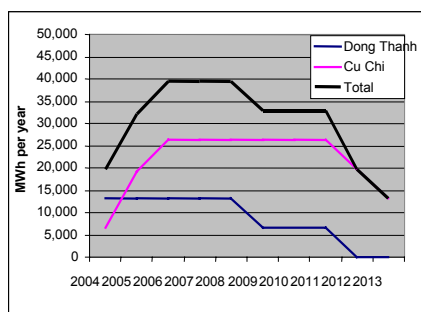
Reduction in Greenhouse Gas Emissions



Revenues from sale of Carbon Credits



Electricity Generation



Source: Date based on the project design document for the Ho Chi Minh City Landfill PCF project, 2003.

The poor suffer from inadequate waste collection services. The poor are particularly under-served in terms of collection. In urban areas about nine out of ten of the poorest households do not receive solid waste collection service. Some live on or near garbage disposal sites, and as a result are exposed to environmental and safety hazards. There are no data available on health impacts of uncollected waste on the poor, but the survey data from low-income areas in Hai Phong, Nam Dinh, HCMC, and Can Tho¹⁴ show a very high incidence rate of pollution-related diseases corresponding to the rate of uncollected waste—as much as 20 to 40 percent.

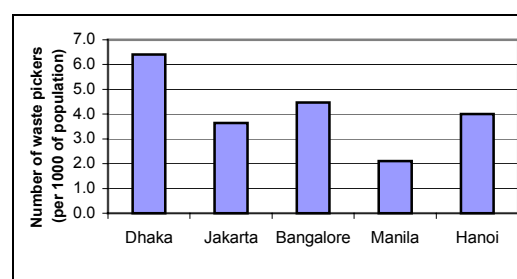
Vietnam’s informal recycling sector. In most developing countries, the informal sector is typically involved in solid waste management activities, which provides livelihoods for many poor people through scavenging and recycling. At the national level in Vietnam, little information is available on the size of the informal recycling sector. In 1997, the number of informal waste pickers in Hanoi was estimated at 6,000. The proportion of Hanoi’s population that are waste pickers is comparable to that of Jakarta and Bangalore but two times higher than that in Manila (Figure 11). There are several best practices in developing countries on formalizing the informal recycling sector (Box 10).

Health Impacts are high. Waste pickers are regularly exposed to high levels of dust, germs, noxious substances, insect bites, and gas during working hours. In a study conducted in the mid-1990s, 78 percent of female workers tested positive for worm eggs.¹⁵ Research shows that many waste pickers suffer from flu, dysentery, fever, lacerations, bruises, fractures, tuberculosis, diarrhea, and other gastrointestinal problems, skin problems (rash, scabies), chest ailments, asthma, pneumonia, parasites, articulation disorders and eye infections and bronchitis, and death (related to

¹⁴ WB, 2003, EIAs for Vietnam Urban Upgrading Project

¹⁵ Gray-Donald, J. 2001. The Potential for Education to Improve Solid Waste Management in Vietnam: A focus on Hanoi, University of Toronto

Figure 11. Estimated Number of Waste Pickers in Selected Asian Cities



Source: Jakarta and Manila: Klundert and Lardinois (1995), *Community and Private (Formal and Informal) Sector Involvement in Municipal Solid Waste Management in Developing Countries*; Dhaka, Bangalore: ILO (2002), *The Informal Sector in Asia from the Decent Work Perspective*

Table 10. Women and Child Pickers in Asia’s Informal Waste Economy

City	Percentage of female waste pickers	Percentage of child pickers
Hanoi ²	66% (street pickers + itinerant buyers)	9% (street pickers + itinerant buyers)
Phnom Penh ³	38% (street pickers)	51% (street pickers)
Wuhan Province-China ¹	46%	No information
Bangalore ¹	50%	No information
Hyderabad, India ⁴	28% (street pickers) 42% (dump pickers)	4% (street pickers) 15% (dump pickers)
Bangkok ⁵	52% (dump pickers)	No information

Source: 1. ILO (2002), *The Informal Sector in Asia from the Decent Work Perspective*; 2. DiGregorio et al. (1997) *Linking Community and Small Enterprise Activities with Urban Waste Management: Hanoi Case Study*; 3. O’Leary, D. (1997) *A Socio-economic Study of Waste Pickers in Phnom Penh*; 4. Galab et al. (2004) *Reuse, recovery and recycling of urban inorganic solid waste in Hyderabad*; 5. *Survey of disposal sites in Thailand, 2003.*

being buried underneath garbage being unloaded from trucks).¹⁶ Women and children bear

¹⁶ Gender and the Waste Economy – Vietnamese and International Experiences, Virginia Maclaren and Nguyen Thi Anh Thu (Editors)

disproportionate health burdens related to their economic positions and their environment.

Gender and waste. In Vietnam, women have the primary responsibility for waste management.¹⁷ In many cities, they dominate the low-paying but secure professions of street sweeping and waste collection by handcarts. Although the presence of women in the informal recycling sector is common in other countries in Asia, their numbers in Vietnam's solid waste-related activities are the region's highest. In Hanoi, for instance, 66 percent of street pickers, itinerant buyers, and sidewalk depot operators are women (Table 10). Men earn more as waste pickers at dumps because they are more likely to work at night, when most of the waste arrives. Men dominate higher paying professions not only in the informal waste economy, such as dealers and owners of recycling businesses, but also in the formal waste economy, such as truck drivers and managers. One example of an innovative program for improving the livelihoods of female waste pickers and processors comes from Hai Phong (Box 11)

Children and waste. Children participate in the informal waste economy as waste pickers on the street and in dumps and occasionally as itinerant buyers. Approximately 9 percent of waste pickers in Hanoi are children (Table 10). Their primary motivation for picking waste is to earn income for themselves or their families. Many children drop out of school when they start picking waste because they are too tired from trying to work as pickers and attend school at the same time. The hazards of working with waste are particularly significant for children, who are more susceptible than those who do not work with waste to such waste-related illnesses as respiratory tract infections, worms, and infections¹⁸. Efforts to reduce the number of children working at waste dumps have been conducted in Hanoi (Box 12).

¹⁷ DiGregorio et al. 1997. Hanoi Case Study. WASTE, Urban Expertise Program, Gouda, the Netherlands; Maclaren, Maclaren V.W. and Nguyen Anh Thi Thu (eds.) 2003 Gender and Waste Management

¹⁸ Hunt, 1966. Child waste pickers in India: the occupation and its health risks

Box 10. Formalizing the Informal Sector

Several "best practices" aimed at improving the livelihoods of informal sector workers, which have been tested in developing countries, are described below:

Colombia. In the 1980s, leaders of the recycler communities, including street pickers, dump pickers, and itinerant buyers, worked together with NGOs and state agencies in several cities of Colombia to organize recyclers. There are currently 94 cooperatives in Colombia, involving 10 percent of the recyclers in the country. The benefits provided by these cooperatives include training, subsidized healthcare, paid vacation, and pensions. Working conditions of recyclers have improved, as they are provided with stable access (away from landfills) to sources of recyclable materials, equipment, and uniforms.

Source: Rodriguez, C. (1999), "Alternative Production, Globalization and Social Exclusion: A Study of the Cooperatives of Informal Garbage Pickers in Colombia."

Cambodia. In Phnom Penh, an NGO known as the Community Sanitation and Recycling Organization (CSARO) has helped waste pickers organize into Self-Help Groups (SHGs), which are collecting 18-20 tons of mixed waste from 30,000 households daily. Members of the SHGs bring the waste to CSARO's Solid Waste Management Center, where they sort, process, and eventually sell recyclables and compostables. Some of the revenue from these sales is used to cover equipment and other business expenses, while the remainder is being used to fund a group credit scheme. The local government authority also pays the pickers a regular fee for their collection services.

Source: http://www.bigpond.com.kh/users/csaro/organization_info.htm

Box 11. Micro-credit Project Raises Incomes of Female Waste Pickers

In Trang Minh Commune in Hai Phong, the Vietnam Women's Union is administering a micro-credit program that offers small loans to female plastic waste pickers and processors. To date, 440 women have received loans of between VND 0.5 million and 1.5 million. Many are using these loans to store their plastics until they can sell them in bulk and receive a much higher price per unit, thus increasing their incomes. Now in its second year, the loan repayment rate for the program is 100%. Women participating in the project also receive training on health and sanitation issues and financial management.

Source: Waste Econ Newsletter, January 2004, No7

Box 12. Assessing the impact of banning child pickers at dumps

Starting in 2002, children under the age of 16 were prohibited from entering the Nam Son landfill in Hanoi and authorities restricted access to the landfill by all pickers to the hours of 2 a.m. to 7a.m. Prior to the ban and access restrictions, there were about 500 child pickers at the landfill. Almost all of the children came from surrounding villages ; 34% had dropped out of school. Was the ban on child pickers effective? What did the former child pickers do instead? These two questions were the subject of a study by Vietnam's Youth Research Institute. The study found that after the ban, only 50 children were still picking waste. Almost 37% of the children who had stopped picking waste could not be contacted to find out why they had stopped and what they were doing. For the remaining children, the ban was the main reason why 26% of them stopped, and the access restrictions caused a further 36% to stop. Most children said that they stopped because of the unpleasant working conditions. About three-quarters of the children had not found another job, and those who had were working mainly in the agricultural sector because of the absence of other types of jobs in the area.

Source: Youth Research Institute and Waste Econ (2004) Proceedings, Workshop on Waste Child Pickers and the Waste Economy

Vietnam has put in place a sound legal framework for environmental protection that specifically addresses guidelines for the management and disposal of all waste streams. This framework is supported by two strategies that apply to solid waste management: (1) the Strategy for the Management of Solid Waste in Vietnam Cities and Industrial Parks (1999), and (2) the National Strategy for Environmental Protection (2003). Other relevant laws and policy documents are listed in Annex 1.

In addition, the provinces of the Southern Focus Economic Zone (HCMC, Dong nai, Binh Duong, Ba ria Vung Tau), which are the country's largest generators of both industrial and hazardous waste, have introduced their own temporary regulations for managing hazardous waste.¹⁹ Most provinces have Master Plans for landfills in provincial towns, and many provinces even have Master Plans for districts, including provision for town landfills.

Strategy for the Management of Solid Waste in Vietnamese Cities and Industrial Parks, 1999.

This strategy, the first in Vietnam, outlines actions to be taken by local governments until the year 2020 to implement a comprehensive approach to waste management. The focus of the strategy is infrastructure development in urban areas and industrial zones. Key features include: legal reform, increased awareness and training, increased privatization and cost recovery, and use of appropriate and modern technologies and their application in Vietnam. The lead agency is the Ministry of Construction and the collaborating agency is MoSTE, now MONRE.

National Strategy for Environmental Protection, 2003.

This strategy addresses overall environmental protection in the country until 2020. The main focus of the strategy is environmental management and capacity building. Key features include promotion of economic approaches to environmental protection, legal and policy reform, promotion of public and civil society involvement,

capacity building targeted at local and national agencies, policy research, and pollution control. The strategy's targets are 90 percent collection of municipal waste, and adequate disposal of over 60 percent of hazardous waste and 100 percent of healthcare waste (Table 11). The lead agency is MoNRE. The targets for SWM are very ambitious, given the current weak institutional capacity, and the operational challenges and financial constraints. Meeting these targets would need much greater government investment, other stakeholder involvement, and donor assistance.

Over the last decade, GOV has showed good signs of commitment to improving solid waste management, especially with regard to a considerable medium-term increase in investment (see section on budget and financing). This has included landfill construction, hazardous waste management, capacity in managing and socializing solid waste services, source separation and composting, and cleaner production (Annex 2).

¹⁹ NORAD, 2003. Master Plan for hazardous waste management in HCMC, Dong Nai, Binh Duong and Ba ria – Vung Tau

MANAGEMENT INSTITUTIONAL FRAMEWORK

Table 11. Solid Waste Management in the National Strategy for Environmental Protection

Targets	Current	2010	2020
Solid waste collected	65%	90%	
Waste separated at source	Common but participation levels not known.	30% households, 70% enterprises	
Waste treated	Industrial waste: unknown Stockpiled agricultural chemicals: 42% Hazardous healthcare medical waste <50%	60% hazardous waste and 100% medical waste	80–95% of total volume in cities and industrial areas.
Waste reused/recycled	20%		30% of collected waste
Enterprises having waste treatment facilities	10-20%	100% newly established enterprises	
Enterprises certified for environmental compliance or ISO 14001	<1%	50%	80%
Eco-labelling in accordance with ISO 14021	0%		100% exported goods and 50% goods for local consumption

MANAGEMENT INSTITUTIONAL FRAMEWORK

The main Ministry responsible for the environment in Vietnam is the Ministry of Natural Resources and Environment (MoNRE). There are three main departments within MoNRE that play key roles in waste management. Additionally, five other ministries and the provincial PCs are also directly involved in waste management activities. Some other ministries have specific role to play in SWM

		Municipal waste	Hazardous healthcare waste	Industrial waste
Ministry of Natural Resources and Environment (MONRE)	<i>Department of the Environment (DoE)</i>	-Planning, formulating strategies, legislation, and policy nationally and provincially -Guiding on application of Vietnam's environmental standards	- Planning, formulating strategies, legislation, and policy -Guiding on application of Vietnam's environmental standards	- Planning, formulating strategies, legislation, and policy -Guiding on application of Vietnam's environmental standards
	<i>Department of Environmental Impact Assessment and Appraisal (EIA department)</i>	-Approving impact assessment reports related to solid waste management systems, including landfills and treatment.	Approving impact assessment reports related to treatment of hazardous healthcare waste projects	-Approving impact assessment reports related to solid waste management systems, including landfills and treatment
	<i>Vietnam Environmental Protection Agency (VEPA)</i>	-Coordinating the environmental inspections of landfills. - Environmental monitoring and coordinating the enforcement of municipalities - Raising public awareness. - Approving treatment and recycling technologies. - Coordinating the planning of landfills.	-Environmental monitoring and coordinating the enforcement of healthcare facilities	- Coordinating the environmental inspections of landfills. -Environmental monitoring and enforcement of industries -Raising public awareness
Ministry of Construction (MoC)		- Formulating policy and legislation, planning and construction of solid waste facilities. - Developing and managing plans for the construction of waste-related infrastructure nationally and provincially.		
Ministry of Health (MOH)		- Assessing impacts on human health	-Overseeing delivery of service for health care waste. -Formulating policies related to waste from healthcare facilities, and supervising their implementation	- Assessing working environment and impacts on human health
Ministry of Industry (MOI)				-Formulating policies - Overseeing operation of IZMB - Supervising and assisting industries to manage waste.
Ministry of Transport (MOT)	<i>Department of Transportation, Urban and Public works (TUPW)</i>	-Planning and managing infrastructure for air, land, railway and maritime transport nationally and provincially -Overseeing the URENCOs,		
Ministry of Planning & Investment (MPI)		-Overall planning of investment projects and coordination of ODA assistance related to waste management		-Planning investment for industrial zones
Provincial/Municipal People Committees (PPC)		-Overseeing environmental management within its jurisdiction. - Planning, urban governance, and fee collection	-Overseeing environmental management within its jurisdiction.	-Overseeing environmental management within its jurisdiction. - Planning, urban governance, and fee collection
<i>Public urban environment companies (URENCO) under PPC or TUPW or DOC</i>		-Waste collection and disposal.	-Waste collection and disposal. as contracted	-Waste collection and disposal. as contracted
<i>Industrial Zone Management Boards (IZMBs) under PPC</i>				- Supervision of industrial zones, including environmental management

Solid waste is one of the highest priorities for Vietnamese cities. Nearly 70 percent of the municipalities surveyed identified solid waste management as one of their top two environmental priorities. Some of the main challenges in solid waste management mentioned by Vietnamese municipalities include a lack of equipment and capital, lack of public awareness, poor or inconsistent urban planning, an insufficient legal framework, and poor coordination among agencies.²⁰

Capability for hazardous waste treatment is lacking. Currently there is a lack of facilities and responsible entities to treat and dispose of many types of hazardous waste. This gap has led factories to dispose of hazardous waste in unsafe ways, either by mixing it with non-hazardous waste (for collection by URENCOs), storing it on site, or dumping it indiscriminately. Hospitals undertake the responsibility for separation, collection and storage of hazardous healthcare waste. However, the task of medical waste management is often shared. For treatment and disposal, they typically either operate their own incinerator or treatment system, or have arrangements with the URENCO for disposal.

State oversight of solid waste is insufficient. The current number of staff employed by MoNRE and DoNREs for oversight and regulation of various environmental functions is now estimated in the range of 400-450 at the provincial and 100-150 at the central levels. With regard to oversight and regulation of waste activities, there are no functional units or staff assigned to this task in provincial DONREs, except HCMC DONRE, under which a functional division of SWM was created with 19 staff, which is still insufficient to carry out the task.

URENCOs have focused mostly on municipal waste management. Each city in Vietnam has a publicly run urban environment company (URENCO) that is responsible for the day-to-day tasks of collection and disposal of all types

of waste. Over the last 10 years, they have improved their collection and disposal of municipal solid waste most significantly, while management of hospital and industrial waste has not received as much attention.

URENCOs are challenged to maintain quality staff. URENCOs have allocated significant staffing to the basic tasks of waste collection, disposal, and street sweeping (Table 12). However, almost 50 percent of solid waste managers surveyed indicated that they have trouble recruiting quality staff and indicated it is hard to find people that are specialized in solid waste management. This problem is compounded by the few training opportunities available to build these skills among their existing staff.²¹

Table 12. URENCO Staffing in Solid Waste Management

Capacity Determinant	Indicator	Range	Average
Collection of waste	Staff/ton waste/dy	0.1-2.8	1.0
Disposal of waste	Staff/ton waste/dy	0.02-0.16	0.04
Sweeping streets	Staff/km swept	1-3	1.7

Source: Survey of 9 URENCOs, 2004.

Research and Development for SWM is taking place but still limited. Research and Development (R&D) activities are mostly funded by the government through the research institutes of MOC and others like CEETIA and INEST. The primary focus has been placed on planning and technologies for collection, transportation, and treatment of hazardous waste. However, the R&D implementation is limited due to the lack of practical applicability, financial investment, and GOV policy support. This is also compounded by poor outreach of researchers to SWM service providers and little environmental liability of waste producers.

²⁰ Association of cities class II in Vietnam, 2002. Strengthening Capacity on Environmental Management,

²¹ Watson, 2004. An examination of Vietnam's Urban Waste Management Capacity.,

National monitoring of solid waste is not undertaken in many urban areas. MoNRE has developed a national environmental monitoring network that, as of the end of 2003, consisted of 22 monitoring stations. There are plans to expand this monitoring to a total of 46 stations. However, there is no systematic monitoring of solid and hazardous waste management, such as waste generation, collection, and waste composition.

Regulatory responsibilities are not clear. MoNRE, through the provincial DoNREs, is responsible for monitoring and inspection of environmental pollution from a factory or industrial zone, in collaboration with MOI and the Industrial Zone Management Board (IZMB). A vague division of responsibility also exists between MoNRE and MOH for hospitals. The lack of clarity of roles of the agencies, along with limited interagency coordination, has led to gaps in enforcement and a lack of supervision of waste management practices, especially among the DOI and IZMB, which typically allocate too few or no resources to environmental management.

Capacity for monitoring and regulation is limited. With the limited amount of staff for environmental inspections, MoNRE can only inspect just over 0.5 percent of the nearly 600,000 factories and hospitals in the country (Table 13). This lack of human resources for inspection is compounded by the fact that the inspections do not normally emphasize major waste-related environmental problems, such as open dumping of hazardous waste and poorly operated incinerators or landfills. Some URENCOs and provincial TUPWs have added to the inspection capacity by establishing an urban management unit, which carries out monitoring of SWM and can issue penalties for violation. Due to the limited resources available to these units, the potential of community-based monitoring and encouragement of environmental compliance by industries is worth exploring (Box 13).

Penalties are increasing but remain low.

MoNRE can issue penalties for environmental violations, including those related to waste management practices that cause environmental pollution. The levels of the penalties doubled between 1998 and 2000; however, they remain too low, as they are only a small expense for many factories (Table 14).

Table 13. Environmental Inspection in 2000

Inspection		Waste Management facilities	
Number of inspectors	Number of facilities inspected	Total number	Types of facilities
230	2,794	590,092	587,948 factories 93 industrial zones 82 cities and towns 1,969 hospitals

Source: NEA, MOSTE, 2001. Includes inspection of a variety of aspects of environmental management, including waste management. Number of facilities from GSO, 1999 data. Industrial zones is a 2004 number from MOI consultant report. "Hospitals" only include hospitals, polyclinics, sanitariums, and rehabilitation hospitals and does not include the 11,229 medical services units.

Table 14. Environmental Penalties issued

Year	% of inspected facilities penalized	Average penalty (VND)
1998	28	380,000
1999	23	550,000
2000	23	795,000

Source: NEA, MOSTE, 2001. Includes inspections and penalties on a variety of aspects of environmental management including waste management.

Box 13. Encouraging Compliance

Ho Chi Minh City has developed a program to encourage enterprises in the industrial and craft sectors to voluntarily invest in environmental protection. The program, which has been active since 1999, includes a fund for pollution minimization and a revolving fund, which has provided loans for environmental investments to 16 enterprises. Additionally, 147 establishments have undertaken the necessary actions and investments to receive certificates of full compliance with environmental standards. The main challenges for the program include a lack of appreciation of the benefits and responsibilities of environmental management by industries, limited incentives provided by the current policies, and limited enforcement effort.

Civil society plays an important role in waste management. Civil society, including the public, NGOs, and other associations, can contribute to improving waste management practices in many ways. For example, actors in civil society are mobilizing communities to collect and separate their wastes, to collect litter in public spaces, and to support improvements in landfills.

Several cities and towns in Vietnam are promoting community programs focused on waste collection, through which community groups, cooperatives, and private enterprises are made responsible for waste collection activities. These initiatives are often occurring in rapidly growing suburban areas, where local URENCOs are not yet providing services; in areas of cities or towns that are difficult for URENCO vehicles to access; or in rural communities where URENCOs do not exist. In Da Nang, for instance, the environmental group “For a Blue Ocean” was created for the purpose of cleaning the beaches. The group works at times when the beaches are the most crowded, and its actions have had a significant positive impact on the attitudes of beach goers concerning waste disposal. In Ha Long Bay, some of the worst waste management problems are not on land but on the sea. Recognizing that floating waste can harm not only the environment, but also tourism, the Ha Long Bay Management Board worked with residents of the Cua Van floating village (40 minutes by boat from Bai Chay beach) to help celebrate World Environment Day in 2002 by collecting waste from the waters surrounding the village.

Socialization programs devolve responsibility for waste management to local community groups and are becoming more prominent throughout Vietnam. For example, the Hanoi People's Committee authorized a socialization program for waste collection in the city in the 1990s. Local community groups may now assume responsibility for hiring waste collectors, purchasing collection equipment, collecting fees, and overall management of the collection system. Several models have been adopted in different wards of Hanoi, with varying levels of government funding and community management. In all of the examples, members of

the Vietnam Women’s Union have played key roles as both managers and collectors.

Landfill siting is an issue for local governments. With the land scarcity and rapid urbanization in the country, Vietnam is facing increased pressure to locate sufficient sites for landfills. Siting needs to be satisfactory to both environmental conditions and perceptions of local communities (Box 14). Presently, landfill siting guidelines for Vietnam concentrate on technical aspects, but fail to consider socio-economic impacts and the role of public participation.²² Environmental impact statements for landfills are not public documents in Vietnam, which means that local residents have little opportunity to view them and make comments. Local residents are represented by their commune officials in siting exercises, but they themselves do not have a direct voice in the decision-making process. Public participation in landfill siting can be constructive only if a good track record of landfill operation and sharing best practices of well-operated landfills takes place.

Box 14. NIMBYism, landfills, and public participation

Almost every country in the world faces the problem of NIMBY (Not In My Backyard) opposition from local communities when trying to site or operate landfills. Vietnam is no exception. NIMBYism develops because of the negative environmental impacts (odours, noise, litter, water pollution, flies, etc.) that poorly designed or poorly managed landfills can impose on local communities. Unsafe disposal practices and increased environmental awareness have produced several examples of NIMBYism in Vietnam. NIMBY protests closed four landfill sites in Hanoi, one permanently and three temporarily, at five different points between 1997 and 2001. Recently (August 2004), local citizens in the northern port of Haiphong went on strike to protest against the local URENCO for the poor siting and unsafe operation conditions at the local landfill.

One way to address NIMBYism is to undertake rigorous environmental impact assessments (EIAs) before approving a proposed landfill. Public participation in EIA and landfill siting is common in other countries. Although it can lengthen the process, it can also help anticipate and reduce resident concerns before they become a serious problem.

²² B. Doberstein, 2003. Environmental capacity-building in a transitional economy: the emergence of EIA capacity in Viet Nam. Impact Assessment

Investments have increased rapidly.

Investments in waste management have increased from VND 195 billion in 1998 to nearly VND 1,100 billion in 2003. About 87 percent are investments to improve municipal waste management. This is followed by medical waste management (12 percent) and industrial waste management (1 percent). Investments in municipal waste management have been increasing steadily since the 1990s, while investments in medical and industrial waste management grew until 2000 and 2001, at which time the investment levels began to decrease (Figure 12).

Central government is providing more investments.

The central government, local governments and ODA investments for solid waste management have all increased since 1998. The largest increase has come from the central government, which committed over 100 times more funds in 2003 than in 1998. Over this period, local government spending has approximately doubled and ODA funding has quadrupled (Figure 13). During the past 5 years, investment in SWM has accounted for between 1.2 and 2.4 percent of total national budget expenditures on development investment. Central government spending is mainly for infrastructure, while local governments are to cover operation and maintenance costs.

Spending on solid waste services is low.

Overall spending on SWM is low (0.18 percent of GNP) compared to other countries in the region (Table 15). Based on a survey of 28 provincial capital cities, each year URENCOs spend an average of VND 160,000 per ton of solid waste disposed (Figure 14). Of these expenses, solid waste collection and transport incur the most expenses, which in many cases accounts for more than 90 percent of the total costs for operation and maintenance.²³ The cost for disposal is typically quite low due to the low cost of current open dumping practices.

Figure 12. Investment in Waste Management (VND billion)

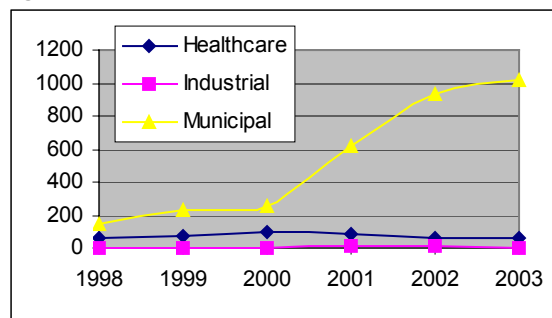
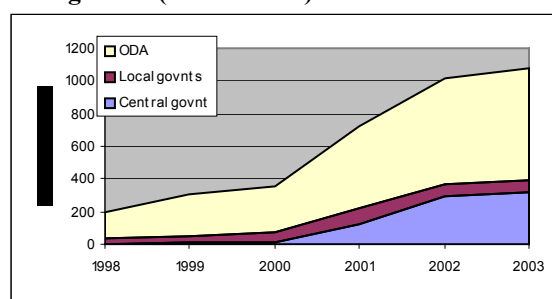


Figure 13. Sources of Investment in Waste Management (VND billion)



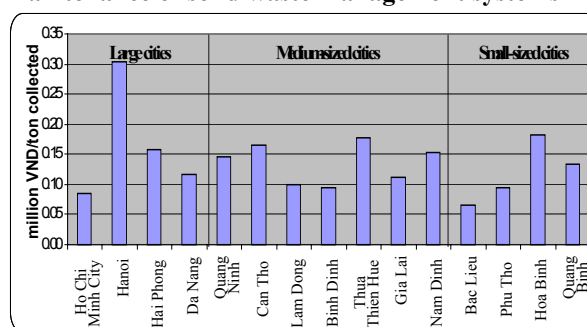
Source: Calculated from UNDP compendium, MPI Database on public investment projects

Table 15. Municipal Urban waste service expenditures

City, country	Year	Per capita expenditure (USD/yr)	% GNP spent on SWM
Vietnam *	2003	3.50	0.18
France	1995	630	0.25
Malaysia	1994	15.00	0.38
Philippines	1995	4.00	0.37
India	1995	1.80	0.51
Colombia	1994	7.80	0.48

Source: Adapted from D. Hoornweg, WB 1999, *What a waste*
*Data for Vietnam calculated by Bank staff;

Figure 14. Expenditures on operation and maintenance of solid waste management systems



Source: Survey of Urenco's, 2003. Large cities: population > 500,000; Medium-sized cities: population 250,000-500,000; Small cities: population < 250,000.

²³ WB staff estimate based on data from 9 URENCOs, 2004.

MANAGEMENT BUDGET AND FINANCING

Financing operational cost is a major obstacle to sustaining investment.

Revenues from solid waste fees cover, on average, 58 percent of costs for operating and maintaining (O&M) solid waste management systems (Figure 15). Figure 16 shows that for the period 1997 to 2002, recurrent expenditures (for operations and maintenance) increased slightly, even though capital investments for new SWM infrastructure rose dramatically. As a result, the O&M budget has declined strongly as a percentage of capital investments. This problem is not unique to the SWM sector: a recent public expenditure review revealed similar shortfalls in O&M budgets in other sectors.

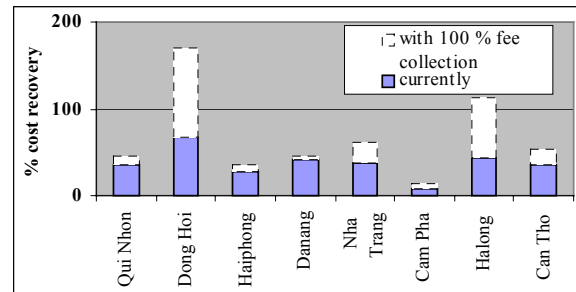
In 2003, URENCOs received a total of VND 404 billion in government subsidies to keep their operations running. Even with these subsidies, URENCOs are not able to operate and maintain all of the solid waste management systems. This is especially important in the case of investments in disposal sites, which may be designed as sanitary landfills, but with insufficient resources are being operated as open dumps.

The planned investment in the SWM master plans for 2010 and 2020 shows the government's continued overemphasis on capital expenditures relative to O&M support. This will jeopardize the sustainability and positive impacts of these investments, and lead to unsafe operation of landfills.

Increase in cost recovery is crucial to relieving financial shortfalls. Cost recovery for SWM is currently very low, but beginning to move in the right direction. URENCOs still heavily rely on government subsidies and have no financial and business autonomy with an emphasis on cost efficiency. Improving operating efficiency of URENCOs and their capital expenditures management can be done through strengthened institutional capacity and improved accountability, autonomy, and incentives. Da Nang may provide a good example as its URENCO is being gradually converted to public service enterprise (Box 15). Another major problem is URENCOs are only able to collect a portion of the solid waste fees from

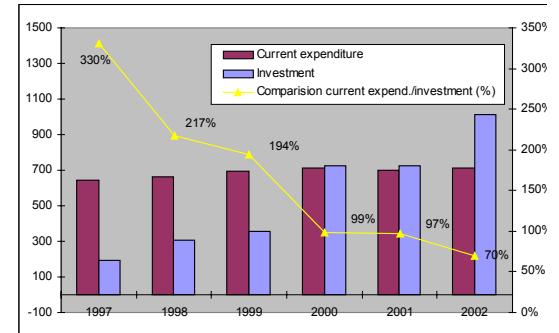
businesses, hospitals and households. In some URENCOs, improvements in fee collection alone could allow them to recover all of their operational costs (Figure 15). For example, Ha Long has been able to double collection rates since 2001 and improve cost recovery from 28 percent to 39 percent over the same time period (Figure 17). Increasing SW fees, or getting greater involvement of private business, are other solutions.

Figure 15. Cost recovery in Selected Cities



Source: Survey of 9 URENCOs, 2004. Fees collected include household as well as business and hospitals. Cost recovery

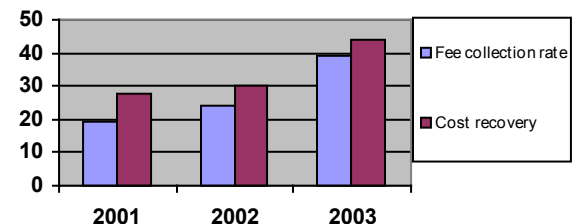
Figure 16. Capital investment vs. current expenditures (%) in SWM



Source: Calculated from UNDP compendium, MPI Database on public investment projects

refers to operations and maintenance costs only.

Figure 17. Improvements in Fee Collection and Cost Recovery in Halong City



Source: WB Three cities sanitation project

Fee levels are generally reasonable. Currently, fees paid for solid waste management typically account for less than 0.5 percent of household expenditures (Table 16), which is an acceptable level in many developing countries. The richest households pay the highest fees for waste collection because they often receive more convenient collection services (e.g. door-to-door collection). In a study of household satisfaction with waste management services in Hai Phong in 2004, 94 percent of households felt that current waste collection fees were reasonable.²⁴ In Hai Phong, this high level of satisfaction with the fees varied little by income group. It is estimated that even if the combined water, wastewater, and solid waste tariff is increased so that the subsidies are phased out, it will not amount to more than 5 percent of household income.²⁵ This fee level, however, may pose a financial burden on the urban poor and even more on the rural poor, for whom GOV subsidies in collection fees will need to be sought or community-based arrangements need to be created for minimizing the cash payment.

People in large cities may be willing to accept fee increases. In order to recover URENCO operational costs through fees, the level of the fee may need to be increased between 2 and 10 times in some cities.²⁶ While most Class II and III cities are reluctant to increase their fees due to the fear of public opposition, recent data suggests that households in large cities may be willing to pay higher fees for improved services. The survey found that 28 percent of surveyed households in Hai Phong were already paying higher fees for extra services, such as collection during Tet (Vietnam's New Year festival) and collection of large waste loads, and that 76 percent of these households felt that the extra fees were reasonable.²⁴

Table 16. Solid Waste Fee Payment by Urban Households

City	Amount paid for SWM fees (VND/household/month)	% of household expenditures
Poorest	4,800	0.5
Near Poorest	5,200	0.3
Middle	4,600	0.2
Near Richest	5,000	0.2
Richest	6,600	0.2

Source: Vietnam Household Living Standard Survey, 2003

Box 15. Investing in the Future of Danang.

Over the past several years Danang has taken aggressive steps to address the problem of local solid waste management through a program that couples investments with improved cost recovery and to transform its management to allow operation as a Public Service Enterprise (PSE).

Investments: The VND 11 billion in investments have included a new landfill, transfer stations, and collection equipment. These have resulted in improved disposal and documented expansion in collection service.

Cost recovery: With the investments and improved service have come increased costs. Raising fees to improve cost recovery has been a difficult challenge for Danang. Targets were set to increase fees 300% in a staged approach from 1998 to 2004, a level estimated to be equivalent to between 3 and 4 percent of income from low- and middle-income households. Due to public resistance, fees have only increased during a fraction of those years, with revenues falling short of targets. Current cost recovery levels are only 50 percent.

Conversion to a Public Service Enterprise: The Danang URENCO is taking steps to allow more control over raising revenues and spending their budgetary resources. In addition, they have arranged service agreements in which relevant city departments pay the URENCOs for performing public services such as beach cleaning and street sweeping. The initial contract in beach cleaning has brought a profit of VND 124 million to the URENCO. The Danang URENCO is seeking to increase cost recovery through the increase in fees and fee collection rates, reduce operation and maintenance costs, and at the same time improve the quality of service.

Source: World Bank, Three Cities Sanitation project

²⁴ Hai Phong PSO 2004, Citizen Report card (forthcoming)

²⁵ WB, HCMC Environmental sanitation project, Project appraisal document, February 2001

²⁶ Based on average cost recovery of 9 URENCOs with 100% fee collection rate shown in Figure 15.

Public subsidies in SWM are still needed. The government's policy is that users shall pay the full cost of service, but in reality SW fees are insufficient to cover O&M costs, let alone contribute to future investment needs. To the extent that fee increases for waste collection may not be approved by Provincial Peoples Councils, GOV subsidies may still be needed for URENCOs to provide services. It is important for the GOV to develop a strategy to phase out the subsidies and to become less financially dependent on ODA assistance, given that Vietnam is likely to graduate from IDA in the medium term. This could be done through restructuring management of URENCOs to increase capital and operation expenditures, and through opening the market to small local service providers and making them more affordable to poor users. Local governments and mass organizations have been effective in mobilizing communities for developing common services like waste collection and disposal and commune cleaning events. Other innovative approaches should be explored.

Private sector participation and other approaches to financing may provide opportunities. Although GOV policy allows the private sector to provide environmental services, there are very few incentives for its participation. Barriers to participation include the lack of an independent regulatory framework on the operational level, an irregular tax structure, licensing delays, lack of transparency and accountability, and corruption. There are good experiences that can be adapted to involving private enterprises in SWM, both in Vietnam (see the section on the Role of Civil Society and Box 16) and elsewhere (Box 17). While engagement of the private sector could provide an effective way to improve cost recovery in Vietnam, many other approaches could also be explored in Vietnam. For example, in other countries taxes and levies have been imposed on high waste-producing activities, such as tourism and the use of non-recyclable or wasteful products or excessive packaging (Box 18).

Box 16. A successful private company working on SWM

Na Thanh Company, which is based in Ninh Hai District in Ninh Thuan Province, was established in 2002 with an initial capital of VND 24 billion for wastewater treatment technology transfer, including wastewater treatment, solid waste collection and disposal, and composting. A high quality composting plant was put in operation in January 2003. The plant employs 345 persons with a minimum salary of VND 1,450,000 per month. The company has a treatment capacity of 120 tons of solid waste and produces 40 tons of compost per day. The company plans to increase its capacity in 2005 to 200 tons of solid waste and producing 50 tons of compost and 2 tons of plastic goods per day.

Box 17. Opportunities for private sector participation in the provision of solid waste management services

The participation of the private sector in waste management services can greatly improve the overall performance of the SWM system in three specific ways: (1) increasing efficiency and lowering the costs of services by introducing commercial principles, competition, customer satisfaction, specialized skills and expertise; (2) mobilizing funds when public financing for investments is insufficient; and (3) introducing international experience and modern technologies into waste management operations. For instance, in the United States, Canada, and the United Kingdom the cost of services has decreased by about 25 percent with greater participation of the private sector. In Latin America, studies in Argentina, Venezuela, Chile, and Brazil have shown up to a 50 percent reduction in costs and significant increases in efficiency with increasing presence of the private sector, while in Malaysia, costs of service provision dropped by 20 percent. The role of local governments in waste management services when the private sector is involved varies in the different countries, but it typically involves defining the scope of the work to be performed by private companies, instituting a system of payments, and supervising the quality of services.

Sources: Sandra Cointreau-Levine (2001), Private sector participation in municipal solid waste management, Guidance Note; and Carl Bartone (2000), The Role of the Private Sector in Municipal Solid Waste Service Delivery in Developing Countries: Keys to Success, in The Challenge of Urban Government

Box 18. Innovative Approaches to Financing Waste Management in Tourist Areas

In general, it is estimated that tourists generate twice as much solid waste per capita as local residents (1.2 kg/tourist population equivalent/day). Tourism-generated waste is particularly challenging in that (a) the bulk of the waste is generated precisely in those prime locations that are appealing to tourists; and (b) tourist-generated waste is concentrated in time, due to the seasonality of the sector, and therefore peaks of waste generation are likely to coincide with peak tourist seasons.

Given the limited financial resources available, many countries have found other alternatives to cover some of the costs. Charging tourists for the use of the beaches and national parks has emerged as a way of generating funds for environmental conservation and waste management initiatives. Funding for waste management services can also be obtained through programs such as (a) environmental levies (e.g. arrival and departure fees); and (b) taxes on goods that are primarily used by tourists. Given that visitors derive benefits from the use of the resource, it is reasonable to ask them to contribute to some of the costs associated with maintaining the resource.

CHALLENGES AND PRIORITIES

Vietnam's solid waste management needs are substantial in relation to existing capacity and the continued growth of urban areas and industrial development. Without undertaking the necessary measures to establish effective handling, treatment, and disposal systems, the growing quantities of waste can have various impacts, from increased health risks to environmental degradation.

The Government of Vietnam recognizes the economic and social costs of poor solid waste management, and is addressing these issues through a combination of policies, financing, and public awareness and participation. As the country moves forward, addressing the following challenges will be critical to achieving the goal of safe and cost-effective waste management in the country. The National Strategy for SWM in 1999 plans investment needs through 2020 to be nearly VND 30 trillion. To meet the NSEP targets, given the current status and spending on SWM, the cumulative amount of investment required for the period 2004–20 period is estimated to be almost VND 10 trillion higher than the planned investment (Table 17).

The broad challenges facing Vietnam are to:

- Increase the attention to SWM systems as integral parts of urban development programs, improving the balance of investments and their technical appropriateness
- Improve the financial and social sustainability of SWM investments
- Address the looming problems of hazardous waste generated by industrial enterprises, hospitals, and stockpiled agricultural chemicals
- Improve the protection of vulnerable groups.

Table 17. Past and Projected Investments in Waste Management, 1999–2020

Investment (trillion VND)	1999-2003	2004-2010	2011-2020
Past and planned investment	3.3	5.2	21.2
Cumulative past and planned investment	3.3	8.6	29.8
Cumulative investment needed to meet 2010 and 2020 NSEP targets*	3.3	10.4	40.0

*Note *: WB consultant estimate*

Source: 1999-2003 investments based on data compiled from government and donor statistics. Projected investments from the National Strategy of SWM in Urban Cities up to 2020, MOC, 1999

Within these broad challenges, the specific priorities are to:

1. Improve investments and operations for municipal waste management services

Investments in waste management in Vietnam have increased more than fivefold since 1998, to a level of over VND 1 trillion in 2003. Investments are planned to continue at approximately this rate up to 2010, and increase further from 2010 to 2020. This growth in investment is needed. However, it will also be important to make investments that are cost-effective, targeted to priority areas, and use the appropriate technology, as a key challenge to ensuring on-the-ground improvements.

While continuing the national program of building new sanitary landfills, the priorities are to ensure proper operation of existing landfills; expand collection to underserved areas and smaller urban centers through cost-effective investments and improved efficiency; and improve SWM services available to poor households. One option to reduce the cost of expanding the number of landfills is to encourage the establishment of larger regional landfills, which can service more than a single community. At the same time, efforts are needed to reduce the amount of waste sent for disposal.

Improving services to the poor will require a combination of focused subsidies from the government, cross subsidies within URENCOs, and expansion of community-based arrangements. Moreover, systematic consultation with and participation by poor communities is needed in the siting, impact assessment, and operation of landfills because the poor are most likely being affected by landfill siting and operations.

2. Improve cost recovery and the sustainability of investments

Currently, fees for solid waste management services recover only an estimated 58 percent of the costs of operation and maintenance of solid waste systems. A strengthened solid waste management system can only be implemented after a full cost-recovery structure is put in place. This will involve the elimination of municipal subsidies and the collection of adequate fees for the provision of services. Different forms of fees—including flat rates, fees linked to provision of services such as water and electricity, and fees linked to ability-to-pay—should be explored.

Improving the financial sustainability of SWM systems could also involve increasing private sector participation and getting the polluters to pay. Experiences in many other developing countries show that as much as 20 to 50 percent of the costs of municipal services could be reduced by increasing participation of the private sector, due to increased competition, introduction of commercial practices, and improved technology.

With regard to the polluter pays approach, some URENCOs are already charging industries and hospitals to treat and dispose their waste. The challenge for establishing workable polluter pays approaches will require good regulation of industries and waste transporters, coupled with enforced standards for treatment and disposal systems.

3. Enhance hazardous waste management regulations and practices

The current practice of using URENCOs to collect, safely treat, and dispose of hazardous waste is inadequate. There is an urgent need to establish hazardous waste treatment systems, including both factory-based handling, treatment, and disposal systems and centralized or shared hazardous waste treatment facilities. The first priority action could be taken in the three Focus Economic Zones (Northern, Central, and Southern) as part of the implementation of the National Action Plan on Pollution Control. But construction alone will not solve the problem. Industries and hospitals must be willing and able to pay for treatment as part of their environmental liability. Other cost-effective options related to hazardous waste management could be considered, including good planning for industrial zoning, industrial restructuring, and relocation of polluting enterprises out of urban residential areas to industrial zones with proper treatment facilities.

In parallel with engaging the responsibility of industries and hospitals, the GOV needs to develop a comprehensive set of policy and regulatory measures, financing mechanisms, clear institutional responsibility, and sufficient resources for monitoring and enforcement. The current vague institutional mandates need to be clarified, while avoiding conflicts of interest between sector development and environmental regulation.

It will also be critical to integrate environmental and social considerations into the privatization process so that environmentally sustainable outcomes can be achieved. The Government aims to privatize around 1,000 SOEs each year between 2004 and 2005, including SOEs with poor environmental performance. The challenge for the government is to place special attention on SOE privatization to ensure that past environmental liabilities are properly addressed; the environmental performance of enterprises is adequately monitored and enforced; adequate conflict resolution mechanisms are in place; and partnerships are forged among private companies, government, civil society, and other stakeholders.

Given the complexity of the issue and the lack of resources available, more analytical work may be needed to explore appropriate options for improved management of hazardous waste.

4. Improve institutional effectiveness, monitoring, and enforcement

Vietnamese cities consider solid waste a high priority. Many URENCOs have begun to respond, using investments and proactive management to reinvent themselves as effective urban environmental service providers. The challenge ahead is to complement the development of infrastructure and upgrading of equipment with improved management by strengthening staff technical skills, improving financial management, and providing incentives for cost-effective management through more financial autonomy and accountability.

There is also a need to strengthen regulatory institutions. Currently staff in MoNRE and DoNREs dedicated to environmental oversight, monitoring, and enforcement of municipal waste management practices by URENCOs need strengthening in most areas. Significant improvements are needed in collecting waste management data for use in planning and public dissemination.

5. Create incentives for waste minimization and recycling

The informal sector is diverting millions of tons of waste from landfill disposal and provides employment to thousands of people, but needs active support from the public and government in order to continue to thrive. Support could include expansion of micro-credit programs, official recognition of the informal sector, development of recycling markets, integration of informal sector activities into the formal sector, assistance in the creation of waste cooperatives, and consultation on new waste management initiatives or policies that might impact their livelihoods.

Recycling could potentially increase to nearly twice current levels, resulting in savings in disposal of between VND 200 and 500 billion nationally each year. Large reductions in disposal could also be achieved through effective composting, since over 50 percent of urban waste in Vietnam is organic and therefore suitable for composting. Reducing the costs of waste disposal through these means will necessitate further expansion in efficiency in the burgeoning market for recyclables. This can be done through economic and other incentives for source separation and equitable and profitable development of private sector recycling operations. Similarly, composting operations could be expanded through development of viable composting facilities that are able to produce marketable quality compost from source-separated materials.

There is also a need to create incentives for cleaner production (CP). Cleaner production technologies could help minimize industrial waste, as could well-designed industrial ecology solutions. Vietnam has achieved much cleaner production through firms implementing inexpensive housekeeping measures. However, these measures are only a first step toward achieving substantial environmental and economic benefits for firms. Adoption of more advanced CP technologies can have a much higher payback. Industrial ecological options can be considered to minimize the costs and get the most valuable out of wastes. To establish a simplified and specialized CP loan fund and provision of information and techniques on CP will be an important step for CP promotion in Vietnam.

6. Improve public information on SWM and enhance social acceptability of waste disposal and treatment solutions

In order to be successful in introducing programs such as source separation, composting, and reducing illegal littering and disposal, the public must be made aware of the negative consequences of improper waste management practices, and also their accountability in paying for better waste management services. Public education programs should target not only adults, but also children in the school system. Improving public awareness and mobilizing cleanup efforts, public participation in waste management public education, and awareness raising programs through schools, communities and businesses should also aim for providing basic hygiene knowledge, as well as practical and innovative ideas on socialization programs, which could devolve responsibility for waste management to local community groups.

With the increased environmental knowledge and the scarcity of land resources, the challenge is to build landfills and other treatment facilities that are environmentally sound and socially acceptable. For this, socioeconomic impacts need to be considered along with environmental impacts when siting landfills. This requires local resident input during siting and during the operation of landfills. Addressing the NIMBY syndrome requires careful public consultation and more widespread implementation of safe waste disposal practices, which will give the public greater confidence that landfills can be safely constructed and operated in their locality.

7. Engage communities in waste management

There is also a need to strengthen the role of civil society in waste management. While civil society groups have demonstrated their important role in several tourist areas in Vietnam by improving public awareness and mobilizing cleanup efforts, public participation in waste management is still in its infancy in the country, especially in regard to encouraging source separation and participation in planning. The challenge ahead will be to support initiatives that offer communities better opportunities to self-organize around community-based waste management issues. This will need to be supported by public education and awareness raising programs through schools, communities and businesses.

Local community groups may assume responsibility for hiring waste collectors, purchasing collection equipment, collecting fees and overall management of the collection system with a certain level of government funding and community management. Local residents should also represent in the planning and monitoring of SWM services although they may not have direct voice in the decision-making process.

Communities could play a crucial role in source separation programs for composting organic waste. Source separation could be a critical factor in producing a marketable compost product from organic waste. More studies are needed to determine how well source separation can work in Vietnam and how to create markets for the compost product.

8. Protect vulnerable groups

The SWM sector has three key vulnerable groups that require protection: waste pickers, women, and children. Waste pickers (of any age and gender) play an important role in recovering waste, but their working conditions are extremely hazardous. Initiatives to reduce the hazardous nature of their work could include requirements for safety equipment, limiting access to dump sites to periods when there are no trucks on the site, provision of public washing facilities at the dumpsites, and separation of hazardous wastes at dump sites into segregated cells.

Women are heavily involved in both the informal and formal sectors, but their work often provides them with less income than men. Ways to remedy this imbalance include adoption of formal sector employment policies that promote gender equality and provision of expanded micro-credit opportunities for women in the informal sector.

Children who pick waste on the streets and at dumpsites are particularly susceptible to many of the health and psycho-social risks such work entails, such as harassment, infections, and injuries. As waste pickers, children also sacrifice their future if they work instead of completing their education. One option for addressing this problem is to ban children from picking waste, but children who work to provide basic needs for themselves and their families may have to look for alternative, possibly riskier work. Special attention should be paid to providing child pickers with educational support and alternative vocational training.

CHALLENGES AND PRIORITIES

Priority Actions for Solid Waste Management in Vietnam

Challenges	Recommendations	Main responsible players
1. Improving investments and operations for municipal waste management services	<ul style="list-style-type: none"> ✓ Operating better existing landfills and building new sanitary landfills ✓ Increasing cost recovery for operation and maintenance ✓ Expanding collection to poor areas, considering focused subsidies from the GOV and cross subsidies within URENCOs for the poor 	MOC, PPCs, Donors URENCOs PPCs, URENCOs PPCs, URENCOs
2. Improving cost recovery and the sustainability of investments	<ul style="list-style-type: none"> ✓ Increasing fee level and fee collection rate ✓ Greater participation of the private sector ✓ Increasing investment in operation and maintenance of SWM systems 	PPCs, URENCOs URENCOs, private sector MPI, MOF
3. Enhancing hazardous waste management regulations and practices	<ul style="list-style-type: none"> ✓ Building centralized and shared facilities for proper treatment of hazardous wastes with feasible technologies ✓ Clearer mandate of regulatory agencies and better coordination mechanism for implementing the current regulations ✓ Promoting and enforcing the Polluter Pays Principle 	MOI, MOH, PPCs, Private sector, Donors MONRE, MOI, MOH MONRE, MOI, MOH, PPCs, industries, hospitals
4. Improving institutional effectiveness, monitoring and enforcement	<ul style="list-style-type: none"> ✓ Creating urban management units with monitoring and enforcement responsibility for waste management ✓ Updating the legal framework and focusing on implementation ✓ Strengthening local authorities in environmental oversight ✓ Improving technical skills and cost-effective management of URENCOs, converting URENCOs to public service enterprises 	PPCs, MONRE, MOC, MOI, MOH MONRE, DONREs URENCOs,
5. Creating incentives for waste minimization and recycling	<ul style="list-style-type: none"> ✓ Creating markets and tax incentives for waste minimization, recycling, and composting ✓ Assisting the creation of waste cooperatives ✓ Supporting craft villages ✓ Expanding Cleaner Production programs 	MONRE, MOF, private enterprises, PPCs, NGOs PPCs, MONRE MONRE, MOI, industries
6. Improving public information	<ul style="list-style-type: none"> ✓ Public education programs on “no littering” and “less waste” ✓ Sharing experiences in waste minimization, recycling, reuse, and composting ✓ Including public consultation in environmental and social assessment for SWM facilities 	MONRE, MOET, NGOs NGOs MONRE
7. Engaging communities in waste management	<ul style="list-style-type: none"> ✓ Mobilizing community-based clean-up efforts, especially in rural areas ✓ Empowering local communities in self-organizing SWM ✓ Supporting source separation programs for composting 	PPCs, MONRE, NGOs PPCs MONRE, Women Union
8. Protecting vulnerable groups	<ul style="list-style-type: none"> ✓ Expanding micro-credit programs and creating waste co-operatives ✓ Reducing hazardous risk and providing safety measures to waste workers ✓ Providing educational support and vocational training to women and children 	Provincial PCs, Women Union, Bank for the poor MONRE, URENCOs MONRE, MOET, NGOs

Note : Refer to the main text and the section « Challenges and priorities » for details

TYPICAL SOLID WASTE MANAGEMENT PRACTICES AND GOOD EXAMPLES

Activity	Low income country	Middle income country	High income country	Good practice	Reference
Source reduction	Not formally organized but reuse and low per capita waste generation rates are common	Some discussion, but rarely incorporated in organized programs	Organized education programs	South Korea: Government programs in the 1990s included campaigns to discourage the use of disposable goods, reduce excessive packaging, and increase the use of reusable shopping bags. Legislative initiatives were introduced, including revision of Waste Management Act (1991) to promote recycling, Volume-based Waste Collection Fee (1995) by which all waste generators must pay for the generation of non-recyclable materials. In Seoul, waste generation per capita reduced by 64 percent and recycling rate increased from 6 percent to 45 percent during 1991–2000	Workshop of IGES/APN Mega-City project 2002
Collection	Service limited to high visibility areas	Improved service. Large vehicle fleet and more mechanization	Collection rate greater than 90 percent. High mechanized vehicles	South Africa: guideline on community awareness campaigns, conducting service needs/willingness-to-pay surveys, area-specific collection systems, and monitoring waste collection systems.	Capacity Building For Waste Collection In Low Income Areas: Developing User-Friendly Guidelines For Municipalities, 2003 http://www.skat-foundation.org/activities/ws/cwg/cwg.htm#1
Recycling	Most through informal sector Mainly localized markets and imports of materials for recycling	Some high technology sorting and processing facilities	Recyclable material collection service with high technologies Attention toward long-term markets	India: Garbage from households and shops stored in separate bins and collected separately by waste workers, who are organized into a group, trained, and provided with protective gear and specially designed collection vehicles. The wet organic waste would be composted in an identified area. The dry recyclable items would be given to the waste workers who could sell these items to scrap merchants. The initiative is sustainable financially and the income from the sale of the compost provides an additional source.	Community Initiative In Solid Waste Management, New Delhi Best practices and local leadership program http://database.bestpractices.org/UN-Habitat
Composting	Rarely undertaken formally	Small-scale composting more sustainable	Popular at both backyard and large-scale	Bangladesh: Waste Concern, a voluntary organization, developed the community-based model involving community under a partnership to turn organic municipal garbage into compost. The model is capable of handling 50 percent of the garbage produced in Dhaka City. The model was approved under the Clean Development Mechanism (CDM) as the first CDM project on waste composting in the world.	Sri Lanka, Vietnam to replicate Bangladesh model of waste management. Organisation of Asia-Pacific News Agencies, 13 September 2004
Incineration	Not common or successful due to high capital and operation costs, high moisture and inert content	Some are in use but experiencing financial and operational difficulties	Prevalent in areas with high land costs	Japan: municipal solid waste incineration accounts for 77 percent of SWM. Waste incinerators can be roughly classified into mechanical stoker types and fluidized bed types. Countermeasures against dioxins include the suppression of dioxin generation by high-temperature and efficient combustion, the collection and decomposition of dioxins using decomposing catalyst and bag filters. These include stoker-type incinerators combined with ash solidification technologies, and gasification and ash melting technologies.	Current state and problems in municipal solid waste treatment technologies http://www.apec-vc.or.jp/072298new/072298b.htm
Landfilling	Low-technology sites, usually open dumps	Some controlled and sanitary landfills	Sanitary landfills with leachate treatment and gas collection systems	Lebanon: Planning and construction of a regional sanitary landfill for the use of 26 municipalities.	Successful planning and private initiatives resulting in the solution of a major waste disposal problem, Lebanon RSWMP – Regional Guidelines. METAP Report, May 2004. Volume 6, Case Studies.

Source: adapted from D. Hoornweg, WB 1999, *What a Waste*; WBI training package on SWM (forthcoming)

Key Surveys and Studies

Municipal Solid Waste Survey, 2004.

The Consultant Data Group, lead by NISTPASS and VEPA, coordinated distribution of a survey to the URENCOs and DONREs in all 61 provinces in March 2004, asking for information on municipal waste generation and collection, medical waste collection, industrial waste collection, disposal facilities, waste management staffing, and expenditures. Follow-up telephone calls produced a 100 percent response rate from the URENCOs and a number of DONREs and helped to verify the survey responses. Although all URENCOs were able to provide data on municipal solid waste collection and generation, few provided industrial or medical waste data, or expenditure data. One cautionary note about the waste generation data is that it is estimated, not monitored data. URENCOs do not collect data on generation, so they provided municipal waste generation numbers based on their estimation of collection coverage. For example, if a URENCO collected 10,000 tons in a year and estimated that it only served 65 percent of waste generators, then waste generation for the province would be given as $10,000 \text{ t} / 0.65 = 15,384 \text{ t}$. Although many of the bigger provinces have dumps or landfills with weigh scales and can provide accurate data on the amount of waste disposed (and therefore collected), smaller provinces have no weigh scales at their disposal facilities and estimate collection tonnage based on the assumed weight of waste in standard collection containers and vehicles.

A detailed survey by MOC in 18 wards of Hoan Kiem District in Hanoi estimated waste generation per capita as 0.65-1.3 kg/day and the collection rate as 91.5 percent in this central part of the national capital.²⁷

World Bank staff carried out a detailed nine-city survey of URENCOs that are being financed or expecting finance from the World Bank. This survey focused on operation and performance of URENCOs with regard to the amount of municipal waste generated and collected, financial aspects, and institutional capacity.

Vietnam Household Living Standards Survey, 2002.

This survey was conducted by GSO in 2002. The total sample size of the survey was 29,529 households, collected by means of a two-stage stratified random sample. In every province, a set of Enumeration Areas (census units) was sampled randomly, from which 15-25 households were selected randomly. The household wealth quintiles are based on household expenditures per capita. The size of each quintile or expenditure group is one fifth (5,905) of the total sample.

Rural Solid Waste Survey, 1999-2000.

The Ministry of Agriculture and Rural Development surveyed 1,750 households in 1999-2000 in 21 provinces representative of Vietnam's eight economic zones. Rural waste consists of wastes from agricultural cultivation, used pesticide and fertilizer containers, livestock cultivation, food processing, daily household activities, medical facilities, schools, and markets.

Solid waste generated from agricultural cultivation was estimated as total amount of waste generated from cultivation of main crops in each zone. The amount was calculated by multiplying the total area of cultivated land per crop type by average biomass post-harvest residue per crop type per hectare.

Solid waste generated from containers of used pesticides and fertilizers was estimated as the total area of cultivated land for five types of crops in the eight zones times the average amount of pesticides and fertilizers used per hectare per zone times a container weight factor (1% for fertilizer packages and 20% for pesticide containers).

²⁷ MOC, 2003 Collection, transport and treatment for waste: Annex 1" Survey in Hoan Kiem District of Hanoi"

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Solid waste generated from livestock breeding was estimated as the sum of waste generated from breeding of five types of livestock (pig, beef, buffalo, horse, and poultry). It was calculated by multiplying the number of livestock (for five types) in each zone by the estimated amount of solid waste generated by each type of livestock per year.

Solid waste generated from food processing in households was estimated as the sum of waste from rice processing, other food crop processing and short term industrial crop processing. It was calculated by the number of households involved in processing of food crops, agricultural products, and short term industrial crops times average amount of waste generated per household per year.

Household solid waste was estimated as the rural population per zone times the amount of waste generated per person per zone (estimated based on survey results).

Solid waste from clinics and health centres was estimated by multiplying the amount of waste generated per bed per year by the number of beds in the area. Similarly, solid waste from schools was estimated as the number of pupils in the area times the amount of waste per pupil per year. Solid waste from markets was estimated as the number of markets in the area times the average amount of waste generated per market per year.

Municipal Waste Composition estimate, 2002. The composition of municipal solid waste was determined by taking samples at different locations along one collection route in a city (one sample at the generation source, one at a transfer point, and one at the disposal site) at four points in time during the year. The samples were then sorted and weighed.²⁸

Domestic Waste Generation Rate, 2002. The national average for the amount of domestic waste generated per capita was calculated by taking the average of the domestic waste generation rates across Vietnam's 61 provinces. Provincial domestic waste generation rates were calculated from a variety of sources, including annual URENCO and DONRE reports, ODA feasibility studies, and several waste generation studies conducted by CEETIA.

²⁸ NEA: Annual reports on Environmental Quality from Regional Environmental Monitoring Stations in Vietnam from 1997-2002; CEETIA: Annual reports on monitoring of solid waste management in the Northern part of Vietnam.

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Estimations and projection

General Trends in Vietnam: Estimates of waste generation were based in part on the general trends in Vietnam outlined in the waste generation section. Below are the sources of information for this:

Trend	Numbers	Citation
Incomes and consumption	Incomes doubled in last 10 years and annual growth was 5 percent from 2000-2002. Private consumption grew 7.9 percent in 2002 and an average of 5 percent from 1992 to 2002.	World Development Indicators, 2003 World Bank data
Population growth	1.3 percent annually.	GSO data
Urbanization	Increase from current level of 19 to 33 percent by 2010	GSO data and World Bank projections
Industrialization	Averaged 7 percent growth annually since 2000. Accounted for 38 percent of growth in 2002.	GSO data
Modernization of healthcare	Growth in hospital beds: 1.4 percent Decrease beds in regional polyclinics, sanitariums, and clinics. Investment in modernization of equipment: \$150 million from 1997-2000 Investment in upgrading of equipment: \$29 million from 1997-2000.	Ministry of Health data. U.S. Department of Commerce

Municipal Waste Generation Estimates National estimates of total municipal waste generation for 2004 were calculated using rural and urban population estimates (GSO statistical yearbook, 2003) combined with average per capita generation rates for urban areas from the Municipal Waste Survey and for rural areas based on the Rural Waste Survey. For other years, estimates were calculated using rural and urban population figures from GSO (statistical yearbook, 2003) for 1997-2002 and projected based on an annual growth rate of 1.3 percent for the total population (World Bank) and 3.6 percent (assuming a growth in urban population from 25 percent in 2002 to 33 percent in 2010) for 2002-2010. The changes in per capita generation rates relative to 2004 were assumed to be proportional to the percent changes in private consumption in Vietnam. For urban areas, it was assumed that the changes in waste generation were directly proportional to changes in private consumption, while in rural areas the change in consumption relative to the national figures was muted, and therefore the percent change in consumption was assumed to be one third of the national change. Consumption growth rates were taken from World Bank data for 1997-2002 and assumed to be the same as 2002 (5.8 percent) for years after 2002.

Construction waste and sewage sludge make up for about 8% of municipal waste,²⁹ but they are not considered in this report because construction waste is normally used for back filling, and sewage sludge is not the responsibility of URENCOs.

Industrial Waste Generation Estimates. The estimates of waste composition in selected industrial sectors come from sampling of factory waste at source, primarily during 2002-03.³⁰ Samples were sorted and weighed for calculation of coefficient of waste generation per production unit. The coefficient is assumed to be unchanged for the 2005 and 2010 forecast. The total amount of waste in each sector (metallurgy, chemical, textile and shoe, energy, paper, and food processing) was calculated based on the sample sizes. The assumption is made that the waste from the surveyed sectors represents 75% of total industrial waste in 2000-03. Data for 2001-2003 were based on survey data, while past and future trends in total industrial waste generation were calculated assuming the growth in waste was proportional to the annual manufacturing GDP growth rate. Manufacturing GDP growth for 1997-2000 was taken from GSO data (GSO statistical yearbook, 2003), and for 2004-10 a 7 percent annual growth

²⁹ VEM2002

³⁰MOI, 2002-2003 survey.

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in manufacturing GDP was assumed. Hazardous waste generation estimates were based on a 1999 VEPA survey of industries, which estimated 125,000 tons of hazardous waste produced for 1999. Past and future estimates of hazardous waste generation were calculated using past and future growth in output by industrial sector in Vietnam combined with estimates of the relative contribution of each sector to hazardous waste generation. The relative contribution of each sector to hazardous waste generation was determined using generation per unit output estimates from Thai industries (DIW and JICA, 2002) times output for each sector in Vietnam in 1999 (GSO statistical yearbook, 2003), normalized to the total generation in Vietnam in 1999 (VEPA survey). Changes in generation for other years were then estimated assuming increases in hazardous waste generation for each sector were proportional to the growth in the output of each sector. Growth in output by sector was derived from GSO data (statistical yearbook, 2003) for 1997–2002 and assumed a conservative growth rate for projections from 2003–10 (60% of the average growth rate reported for each sector from 2000–02).

Waste from mining activities is not considered in this report.

Craft Village Waste Generation Estimates. These estimates are based on material and energy balance studies of enterprises in typical craft villages. The studies examined all stages of the production process and estimated both the amount of material and energy input per unit of output and the amount of solid waste generated per unit of output. Total waste generated by a given type of craft village was calculated by multiplying the waste generation coefficients times total production in that type of craft village.³¹

Hazardous Healthcare Waste Generation Estimates. Based on 11 previous studies of hazardous healthcare waste generation in Vietnam, the amount generated is approximately 0.44 kg/bed/day, or 20 percent of general health care waste generation rate of 2.21 kg/bed/day.³² This was the assumed value for 2002. For regional polyclinics, sanitariums, and clinics, data on hazardous healthcare waste generation per bed was not available. It was assumed to be 0.1 kg/bed/day in 2002 based on interpretation of data available from other countries. The number of beds in hospitals, regional polyclinics, sanitariums, and clinics in each province and number of beds are taken from the annual health statistics of the Ministry of Health, Department of Planning and Finance. The total amount of waste is likely underestimated because there is no study on the amount of hazardous healthcare waste generated from medical treatment in households and clinics without beds. This kind of waste is not collected and treated by the MOH healthcare waste system, but rather is mixed with municipal waste.

For 1997–2002, hazardous healthcare waste generation estimates were calculated using the reported number of beds for each type of facility. It was assumed the hazardous healthcare generation rate per bed increased at a rate of 2 percent each year. From 2002–10, the number of beds in hospitals was assumed to increase in proportion with future population growth (GSO population forecasts). As the number of beds in regional polyclinics, sanatoriums, and clinics decreased from 1997 until 2002, it was conservatively estimated that the number of beds in these facilities remained at the 2002 levels until 2010. The annual increase in hazardous healthcare waste generation per bed in all facilities was assumed to be 2 percent from 2002 until 2010.

Fee amount estimate. Amount needed in fees from households was calculated based on an average household waste generation rate of between 1.1 (low income households) and 1.9 tons/yr (high income households). The current average cost of collection and disposal is VND 0.16 million per ton. Income levels were derived from Vietnam Household Living Standard Survey, 2003.

³¹ INEST, 2003. Research and proposed measures for improvement of environmental conditions in craft villages, KC08-09.

³² Pham Ngoc Chau, 2004. Consultant report submitted to WB.

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Calculation of investment need for meeting 2010 and 2020 SWM targets

Projected investment needed for municipal waste management assumes that municipal waste generation will be 21 million tons in 2010 and 42 million tons in 2020; 30% of solid waste will be separated at source, and 90% will be collected in 2010 and 2020; average capital investment for treatment about VND 1.6 million /ton, based on investment trends from 1999-2003.

Projected investment needed for medical waste management assumes medical waste generation will be 19,000 tons in 2010 and 22,000 tons in 2020; 100% of medical waste will be treated by 2010; average capital investment for treatment is 14 million VND/ton.

Projected investment needed for industrial waste management assumes industrial waste generation will be 2.76 million tons in 2010 and 9.66 million tons in 2020; 100% of new enterprises will have waste treatment facilities by 2010; the overall industrial waste treatment rate will be 80% by 2010; 20% of collected waste will be reused/recycled by 2010 and 30% by 2020; average capital investment for treatment is VND 0.5 million /ton.

Investment capital needed for meeting the targets of SWM by 2010 and 2020, VND billions

Investment needed to meet targets in 2010 and 2020	1999–2003	2004–10 (projected)	2011–20 (projected)
Municipal		5870.6	30240.0
Medical		185.5	56.0
Industrial		993.6	2704.8
Total	3300	7049.7	33000.8
Cumulative (2004-2020)			40050.5

GLOSSARY OF TERMS

Biodegradable: Capable of decomposing rapidly by microorganisms under natural conditions. Most organic materials, such as food scraps and paper, are biodegradable.

Collection: The process of picking up wastes from residences, businesses, or a collection point, loading them into a vehicle, and transporting them to a processing site, transfer station, or landfill.

Commercial waste: All municipal solid waste emanating from business establishments, such as stores, markets, office buildings, restaurants, hotel, shopping centers, and entertainment centers.

Composting: The controlled biological decomposition of the putrescible fraction of MSW (in the presence of air) to form a humus-like material.

Controlled dump: A waste disposal site that has no environmental controls, but undertakes basic waste management practices such as correct placement of the waste in thin layers and compaction and cover.

Decomposition: The breakdown of matter by bacteria and fungi, changing the chemical makeup and physical appearance of MSW in landfills, composting, and/or fermentation.

Disposal: The final placement of waste that is not salvaged or recycled.

Domestic waste: MSW composed of garbage and rubbish, which is generated as a consequence of household activities.

Dump: A site used to dispose of solid waste without environmental controls.

Engineered landfill: A disposal site that has been designed with at least some controls to minimize environmental and health hazards, including water pollution from runoff and leaching. MSW is spread in thin layers, compacted, and covered with a fresh layer of soil each day. These environmental control systems are not necessarily complete or operating properly.

Generation rate: The amount of waste that is generated over a given period of time

Hazardous healthcare waste: Healthcare waste, which includes any of the following: blood and blood products, egesta, human or animal body parts or organs, syringes or

needles, sharp objects, pharmaceutical products, chemicals, and radioactive materials used in the health sector. If not properly treated, these substances will be hazardous for the environment and people's health.

Hazardous waste: Waste generated during production and other activities by society that can pose a substantial or potential hazard to human health or the environment when improperly managed.

Healthcare waste: Substances generated in healthcare units from examination and treatment, laboratory tests, disease prevention, research, training, and nursery. Healthcare waste includes five types: clinical waste, radioactive waste, chemical waste, compressed air containers, and human waste.

Incineration: A treatment technology involving destruction of MSW by controlled burning at high temperatures.

Industrial waste: Hazardous and non-hazardous materials generated during an industrial operation.

Institutional waste: Waste from institutions, such as schools, medical facilities, and government offices.

Landfill gas (LFG): A gas produced by the degradation of organic matter in waste disposed in landfills. It is made up of approximately 50% of the flammable gas methane and can be collected from landfills for use as a fuel gas or for the production of electricity.

Landfill: A disposal site for waste.

Leachate: Wastewater that collects contaminants as it trickles through MSW disposed in a landfill. Leaching may result in hazardous substances entering surface water, groundwater, or soil.

Moisture content: The fraction or percentage of a substance that is water.

Municipal solid waste (MSW): Includes waste generated in households, commercial and business establishments, institutions, agricultural wastes, and sewage sludge.

NIMBY: Acronym from an English expression meaning "Not in my backyard." It expresses people's objection to the siting of an urban waste management facility (such as a landfill or composting facility) in or near their community.

Open dump: A site used to dispose of waste without any management and/or environmental controls.

Recycling: Treatment of waste to turn it to useful materials for future use.

Resource recovery: The process of obtaining matter or energy from MSW.

Reuse. Waste reuse occurs when materials or products are reused in their original form or for their original purpose with no need to apply physical or chemical treatments. Some minor physical treatment may be required, such as painting or making repairs.

Sanitary landfill: Waste disposal site that is designed and operated to minimize environmental and health hazards, including water pollution from runoff and leaching. MSW is spread in thin layers, compacted, and covered with a fresh layer of soil each day.

Socialization of environmental protection activity: A process to mobilize domestic and international organizations and individuals to invest in the environment and environmental protection in the country.

Solid Waste: Non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes. Solid wastes also include sewage sludge, agricultural refuse, demolition wastes, and mining residues

Source reduction. Source reduction occurs in the household when the householder makes purchasing decisions that reduce the amount or toxicity of products and materials entering the household over a given period of time. At the industrial plant, source reduction might encompass the use of more efficient manufacturing techniques that produce less scrap or packaging waste

Source separation: Separation of materials at the point of waste generation into different components, such as organic and inorganic waste. With source-separated waste, it is much easier to recover recyclable items and to compost the organic fraction of the waste stream.

Transfer station: A facility at which municipal solid waste from collection vehicles is consolidated into loads that are transported in larger trucks or other means to more distant disposal sites.

Waste picking: A process of manual extraction of recyclables and reusable materials from mixed MSW for further use and /or processing.

Waste: Materials discharged from living, production, or other activities. Waste exists in different forms: solid, gaseous, liquid or others.

Source : Adapted from "Planning Guide for Strategic Municipal Solid Waste Management in Major Cities in Low-income Countries," Draft Planning Guide, February 1998, Environment Resources Management, London.; VEM02; GOV documents; UNIDO: The need for ecologically sustainable industrial development, Learning Unit 2.

Environmental Protection Legislation

Law on Environmental Protection passed on December 27, 1993, and the Governmental Decree No 175-CP of October 18, 1994, detailing the implementation of the Law on Environmental Protection.

Decree No 121/2004/ND-CP of May 12, 2004, of the Government promulgating the Regulation on Sanctions against Administrative Violations in the field of protection of the environment.

Decision No. 256/2003/QD-TTg, issued on April 2, 2003, by the Prime Minister approving the National Strategy on Environmental Protection up to year 2010 and Vision to 2020.

Decision No. 64/2003/QD-TTg, April 22, 2003, of the Prime Minister approving the plan for managing the establishments causing seriously environmental pollution.

Solid and Hazardous Waste Legislation

Decree No. 13/2003/ND-CP of February 19, 2003, of the Government providing the provisions for the commodities prescribed as being dangerous/toxic and their transportation via roads.

Directive No. 199/TTg, April 3, 1997, by Prime Minister on urgent measures to manage solid waste in urban areas and industrial zones.

Decision No. 60/2002/QD-BKHCNMT, August 7, 2002, of the Minister for Science, Technology and Environment providing the technical guidelines on the dumping of hazardous waste.

Decision No. 152/1999/QD-TTg, July 10, 1999, of the Prime Minister approving the National Strategy for Solid Waste Management in Industrial and Urban Areas until 2020.

Decision No. 155/1999/QD-TTg issued on July 16, 1999, of the Prime Minister promulgating the regulations on hazardous waste management.

Inter-ministerial circular No. 1590/1997/TTLT/BKHCNMT-BXD, October 17, 1999, of the Ministry of Construction and Ministry of Science, Technology and Environment and Ministry of Construction giving instructions to implement Directive No. 199/TTg by the Prime Minister on urgent measures in solid waste management in urban and industrial zones.

Decision No. 60/2002/QD-BKHCNMT dated August 8, 2002, of Ministry of Science, Technology and Environment guiding the implementation of hazardous waste burying technique.

Toxic Substances Legislation

Directive No. 29/1998/CT-TTg dated on August 25, 1998, of Prime Minister on strengthening the management of the use of plant protection drugs and persistent organic pollutants (POPs).

Decision 1970/1999 QD-BKHCNMT, November 10, 1999, of the Ministry of Science, Technology and Environment on the issuance of technological procedures

applied to disposal of banned plant protection chemicals in the form of phosphorous organic compounds.

Decision 1971/1999-QD-BKHCNMT, November 10, 1999, of the Ministry of Science, Technology and Environment on the issuance of technological procedures for the disposal and reuse of cyanide.

Decision 1972/1999-QD-BKHCNMT, November 10, 1999, of the Ministry of Science, Technology and Environment on the issuance of technological procedures applied to dispose banned chlorinated organic chemicals for plant protection.

Medical Waste Legislation

Decision No. 62/2001/QD-BKHCNMT, November 21, 2001, promulgating the technical requirements for incinerators of medical waste.

Inter-ministerial circular No. 2237/1999/TTLT/BKHCNMT-BYT, December 28, 1999, guiding the implementation of the regulations on safe application of radioactive techniques in medical services.

Decision No. 2575/1999/QD-BYT, August 27, 1999, of the Minister of Health promulgating the regulations on medical waste management.

Official letter No. 4527-DTg, June 8, 1996, of the Ministry of Health guiding the treatment of solid waste from hospitals.

Legislation on Recycling

Official letter No. 1146/BKHCNMT dated on May 6, 2002, of Minister for Science, Technology and Environment approving the National Action Plan for Cleaner Production.

Decision 03/2004/QD-BTNMT, April 2, 2004, of MONRE on importing waste as materials for domestic production.

Legislation on Waste Management Infrastructure facilities

Inter-ministerial circular No. 01/2001/TTLT-BKHCNMT-BXD, January 18, 2001, guiding the regulations and environmental protection applied for the space planning of the siting, construction, and operation of landfills.

Inter-ministerial circular No. 10/2000/TTBXD, August 8, 2000, guiding the preparation of EIA reports for the planning of construction projects, including solid waste management during and after construction.

Inter-ministerial circular No. 29/1999/QD-BXD, October 22, 1999, promulgating the regulations of environmental protection applied for the construction sector.

Ministerial circular No. 1817/1999/TT-BKHCNMT, October 21, 1999, guiding the identification of projects prioritized for investment as described in clause 7 of list No. 1 in annex 1 of decree 10/1998/ND-CP on measures to encourage and guarantee foreign direct investment activities related to environmental protection, environmental rehabilitation and waste recycling and reuse.

Fees and Charges

Ordinance No. 38/2001/PL-UBTVQH, August 28, 2001, of the Standing Committee of the National Assembly on prescribing Fees and Charges. This is generally supported by local regulations issued by People's Councils or Committees.

Governmental Decree No. 57/2002/ND-CP dated on June 3, 2002, providing the details on the implementation of the Ordinance No. 38/2001/PL-UBTVQH on prescribing Fees and Charges.

Circular No. 63/2002/TT-BTC dated on July 24, 2002, of Ministry of Finance guiding the implementation of provisions on Fees and Charges.

Circular No. 71/2003/TT-BTC dated on July 30, 2003, of Ministry of Finance guiding the implementation of the provisions on the fees and charges for solid waste collection and treatment (prescribed as one of "Hygienic services").

Standards

TCVN 6696-2000 requirements for environmental protection for sanitary landfills.

TCVN 6705-2000 requirements for separation of non-hazardous waste.

TCVN 6706-2000 requirements for separation of hazardous wastes.

TCVN 6707-2000 prevention and warning signs for hazardous waste.

TCXDVN 261: 2001 – Landfill – Standard for designing

International Conventions

Vietnam is a signatory to a number of major international conventions, of which at least there are three relating to waste management.

Kyoto Protocol and the Clean Development Mechanism (CDM). Vietnam ratified the Kyoto Protocol in 2002 and has prepared a National Strategy Study for the CDM that allows industrialized countries to purchase "carbon credits" from projects in developing countries and count those emissions reductions against their commitments. Collection and use of landfill methane is one of the technologies that can financially benefit most under the CDM as it can increase the financial internal rate of return of these types of projects between 5% and 10%³³

Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and Their disposal. The Basel Convention entered into force in 1992 with Vietnam ratifying it in 1995. The Convention focuses on the transport and treatment of hazardous waste. The Competent Authority and Focal Point to the Basel Convention is VEPA. Vietnam has undertaken many activities to implement the convention, including training, waste inventories, strategies, legal reform, technical

guidelines, and promulgating a hazardous waste management classification system.

Stockholm Convention on Persistent Organic Pollutants (POPs). This convention has been adopted in response to the need to manage, reduce, and eliminate POPs, which are posing health and environmental concerns. Vietnam signed the POPs convention in 2001 and ratified it in 2002. The Ministry of Natural Resources and Environment (MONRE) is currently developing a National Implementation Plan.

³³ WB, Analysis of Carbon Finance Unit .

ANNEX 2: LIST OF ODA PROJECTS

No.	Project title	Time period	Budget (\$US)	Executing agency	Objectives	Status and remarks
ADB						
	Component for SWM under the HCMC Environmental Improvement Project (Loan No 1702)	2000-2006	100,000,000	DOSTE HCMC, PIUs	Capacity building and institutional support to effective and sustainable management of urban services; environmental improvement and reduction of environmental health hazards; sustainable and well-planned infrastructure development and urban services. Components funded by NORAD (2002-2004): development of a regional Hazardous Waste Masterplan and Air Quality Monitoring.	Overall implementation progress is only 12% against a time elapsed of 68%
	Hazardous waste management	1997-1998	600,000	MOSTE	To assist the government in establishing an appropriate management system on hazardous waste; in promoting sound HWM	Completed project
AUL/AusAID						
	Source separation and composting of Municipal Waste	1997-1998	163,000	NA	low cost, community-based model for sustainable SWM.	Completed project
	Institutional Strengthening of Danang Urban Environment Company	Dec 2001- Dec 2004	AUD 2 million	Danang URENCO	<ul style="list-style-type: none"> improve the drainage and sanitation services in Danang strengthen URENCO improve the water supply service in Danang 	<ul style="list-style-type: none"> A Board of Management for Service Agreements. Operations & Maintenance IT: Customer Care and Billing Environment Management System
CIDA						
	Making Waste Work for the Economy	2000-2005	2,109,915	NISTPASS	To improve the economic opportunities, environment, and the quality of life for all communities and especially low-income waste workers in Vietnam.	Ongoing Project
	Vietnam – Canada Environment project (VCEP), phase 2	2000-2005	7,000,000	VEPA, MONRE	To strengthen the pollution management capacities of selected national and local institutions.	Ongoing Project
DANIDA						
	Improvement of Solid Waste Management in Nghe An Province	42 months, started Oct 2001	19,800,000	Nghe An PPC, Urenco Vinh	<ul style="list-style-type: none"> Municipal solid waste and healthcare wastes are treated and disposed in sustainable ways in Vinh City and Cua Lo Town Sustainable and environmentally sound solid waste disposal replicable to other regions of Nghe An Province 	Ongoing Project
	Enhanced Environmental Monitoring Capacity and Improved Solid Waste Management in Thai Nguyen City	30 months, started May 2004	12,229,000	DONRE Urenco	<ul style="list-style-type: none"> Improvements to the solid waste collection, transport, and disposal system Environmental management Solid waste pollution inspection and monitoring capacities improved 	Ongoing Project
	Improvement of Solid Waste Management in Nghe An Province, Phase II	36 months, will start by end 2005	14,542,000	Nghe An PPC, Urenco Vinh	<ul style="list-style-type: none"> Municipal solid waste of Vinh City and Cua Lo town Enhanced capacity of Urban Environmental Companies (URENCO) in Nghe An for information exchange on solid waste management 	approved
	Industrial and Urban Development in Viet Tri City, Phu Tho	2001-2004	2,467,000	Phu Tho DONRE	To increase awareness about cleaner production and health safety for workers; to build capacity for technical and managing officials on cleaner production and health safety	Completed phase 1

ANNEX 2: LIST OF ODA PROJECTS

No.	Project title	Time period	Budget (\$US)	Executing agency	Objectives	Status and remarks
IAEA						
	Infrastructure for Treatment and Management of Radioactive Waste	1995-2001	208,000	VAEC	To formulate the national policy and legal framework and to establish technical infrastructure for radioactive waste management.	Ongoing Project
FRANCE						
	Solid waste treatment in Nam Dinh	1999-2003	3,400,000	NA	To improve capacity of staff and activities in solid waste treatment	Completed project
JICA						
	Urgent Equipment Supply for Waste Management in Hanoi City	2002-2003	7,790,700	URENCO Ha Noi	To increase the effect of solid waste management in Hanoi and improve material facilities	Ongoing Project
HUMC						
	Cau Dien Compost Factory (E3/97)	1998-2000	4,000,000	Hanoi Urenco	To improve waste treatment through composting	Completed project
KfW						
	Waste Water and Solid Waste Programme in Provincial Cities - Programme Centre, City of Vinh EUR 12,00,000,00	2003 - 2008	For solid waste component: KfW: EUR 3 million; URENCO: EUR 886,000.00	URENCO Vinh City	Secure and environmentally sound rainwater, wastewater and solid waste disposal in accordance with the population's economic capacities	Selection of implementing consultants is in process.
SDC						
	Namdinh Urban development (1 st phase)	1996-1999	6,708,000	Namdinh Province's People committee	First-stage improvement to drainage and sewerage; design and implementation of a SW collection system; support water supply distribution; implementation of PAR	Completed project
	Nam Dinh Urban Development (2 nd phase)	2003-2006	12,695,000	Namdinh Province's People Committee	* Enhance the capacity of Nam Dinh Municipality in managing sustainable urban development and effective demand-oriented urban service delivery * Formulate medium-term investment programs for the drainage, wastewater, solid waste, water supply sectors * Establish dynamic community participation on a city-wide sustainable basis	Pipeline project
	Dong Hoi Urban Development	1997-2006	7,640,625	Quang Binh PPC	Public Administration Reform process; assist the city in solid waste management.	Ongoing project
	Hazardous Waste Project in Nam Dinh	2003-2006	1,971,753	NA	Develop a comprehensive, sustainable hazardous waste management concept, including waste minimization, reuse/recycling, and safe disposal. Develop a series of subprojects, financing requirements and sources of financing for the implementation of the hazardous waste management concept.	Ongoing project
	Urban development in Hue city	1996-1999	5,072,000	Huế PPC	To assist local authorities in establishing the capacity to protect freshwater resources and the coastal zone in the face of sustained growth and tourist development; assist the city in solid waste management.	Completed project

ANNEX 2: LIST OF ODA PROJECTS

No.	Project title	Time period	Budget (\$US)	Executing agency	Objectives	Status and remarks
SWE/Sida						
	Strengthening the pollution control and solid waste management in urban areas and industrial center in VN	1996-1997	313,000		To develop national guidelines for management of solid waste in urban and industrial areas	Completed project
UNIDO						
	Cleaner production Center VIE/ 96/063	1998 - 2003	2,800,000	Institute for Environmental Science and Technology Hanoi University of Technology	To disseminate concept of cleaner production and promote the application of cleaner production in industrial activities to reduce pollution in Vietnam	Completed project
USAID						
	Socialization of Solid Waste Management in HCMC	2002-2003	142,000	US-AEP, iCMA, TAF	To develop a legal framework to enhance the participation of the non-public sector in collection and management of municipal solid waste.	Ongoing Project
WB						
	Solid Waste Management Strategy and Action Plan for Ha Long/Cam Pha and Hai Phong	NA	400,000	Hai Phong, Quang Ninh, PPC	To assist Halong and Hai Phong Authorities to develop a solid waste management strategy and action plan.	Ongoing Project
	Solid Waste Management Strategy and Action Plan for Ha Long/Cam Pha and Hai Phong	1999-1999	250,000	Hai Phong PPC	To assist local authorities in establishing the strategy and plan in solid waste management	Completed project
	Wastewater and Solid Waste Disposal, North	TBA	8,690,000		To enhance activities in wastewater and solid waste disposal in North of Vietnam	Pipeline project
WHO						
	Hospital waste and related risks management (VTNEUD001)	1998-1999	439,000	MoH	To improve hospital waste treatment and related risks management.	Completed project

ENVIRONMENT/GEOGRAPHY	ECONOMY/SOCIETY
<p>Geography Area: 331,900 km² Land boundaries: <i>Total:</i> 4,510 km <i>Border countries:</i> China (1,306 km), Cambodia (1,137 km), Laos (2,067 km) Coastline: 3,260 km Maritime claims: <i>Continental shelf:</i> 200 m or edge of continental shelf <i>Exclusive economic zone:</i> 200 nm <i>Territorial sea:</i> 12 nm Climate Tropical in south; tropical monsoon in north with hot, rainy season (mid-May to mid-September) and warm dry season (mid-October to mid-March) Terrain: Mekong River Delta in the south (area approx. 59,000 km²); the Red River Delta in the north (area approx. 17,000 km²); and mountains in the central and west. Elevation extreme: <i>Lowest point:</i> 0 m at the sea level <i>Highest point:</i> Phan xi phang 3,000 m Mineral resources: Oil, natural gas, coal, iron, zinc, bauxite Environment Forest: 11,784,589 ha (to July 2003) Forest cover: 35.8% Protected areas Protected areas: National Parks (957,330 ha); Natural protected areas (1,369,058); Landscape protected areas (215,287 ha) Number of protected areas: 27 National Parks, 60 natural protected areas, 39 Landscape protected areas Surface Water quality Good: Northwest, Central Highland Moderate: North Central Coast, South Central Coast, Northeast Region Poor: Northeast of Mekong, Mekong River Delta, Red River Delta, Groundwater quality Good: Northwest, Central Highland Moderate: Northeast, North Central Coast, South Central Coast Poor: Red River Delta, Northeast of Mekong, Mekong River Delta Air quality (Ambient – Hanoi) SO₂: 0.04–0.06 mg/m³ Noise: 7602–75.7 dBA Solid and hazardous waste Municipal waste: 12,800,000 tons/year Industrial hazardous waste: 128,400 tons/year Industrial non-hazardous waste: 2,510,000 tons/year Hazardous healthcare waste: 21,000 tons/year</p>	<p>Natural disaster Total loss: 1,276 billion VND (2003) <i>Flood (above Level 3 and all flashfloods)</i> Number of occurrences: 17 (2003) <i>Typhoon</i> Number of occurrences: 10 (2003) <i>Drought</i> Number of occurrences: 2 times lasting for 5 months (2003) <i>Forest fire</i> Number of occurrences: 256 (2001) Area of loss: 1,500 ha (2001) Environment-international agreements: Party to: Biodiversity, Climate Change, CITES, RAMSAR, Basel, Ozone Layer Protection, MARPOL, Law of the Sea, Desertification, POPs conventions, and Kyoto Protocol Economy GDP: \$39 billion (2003) GDP growth rate: 7.2 % (2003) GDP-composition by sector (2003): <i>Agriculture:</i> 21.8% <i>Industry:</i> 40% <i>Service:</i> 38.2% Inflation rate of consumer price index: 3.2% (2003) Unemployment rate of labor force working in urban areas: 5.8% (2003) Exports of good and services/GDP: 59.3% (2003) Industrial production growth rate: 16% (2003 at 1994 price) Agricultural production growth rate: <i>4.1% (2003 at 1994 price)</i> Agricultural products: rice, rubber, corn, sugarcane, coconuts, soybeans, coffee, cashew, and aquatic products. Exports: total value \$20.2 billion (fob, 2003) Import: total value \$22.5 billion (fob, 2003) Gross Domestic Investment/GDP: 35.1%(2003) Gross national saving/GDP: 32.6% (2003) Society <i>Population:</i> 81.3 million (2003) Population growth rate: 1.2% (2003) Labor force: 42 million (2003) Birth rate: 19.0 births/1,000 population Death rate: 5.8/1,000 population (2002) Infant mortality: 26 deaths/1,000 population (2002) Access to safe water (percentage of population): 56 (2002) Access to sanitation latrines (percent of population): 44 (2002) Life expectancy at birth: 69 years (2002) Literacy (percentage of population of age 15+): 94 National Capital: Hanoi Administrative divisions: 61 provinces (2003) and 64 provinces (2004)</p>

Source: Data compiled from Statistic books (GSO), SOE reports (NEA), VEM2002-2004, MONRE reports on hydrology and meteorology.